Scie Library

JUL 1 7 1945

VE DOLLARS PER YEAR — TY CENTS P

JULY, 1945

Partner with the automobile in the development of modern transportation . . . partner in the Victories of two World Wars . . . STA-VOL-ENE is the "Natural" known throughout the World – partner of motor fuels in the air and on the ground.

Hanlon-Buchanan, Inc

PIONEER NATURAL GASOLINE MANUFACTURER

EXPORT TERMINALS:
Goodhope, La. Corpus Christi, Tex.
Houston, Texas Texas City, Texas
Baytown, Texas Galena Park, Texas

TULSA 1, OKLAHOMA
NATIONAL BANK OF TULSA BUILDING
PHONE 3-1101 or L.D. 358 WIRE – OR WRITE P. O. BOX 1559
Cable Address— STAVOLENE, Tulsa, U. S. A.

FOREIGN REPRESENTATIVE:
Banks, Williams & Co., Ltd.
4 Lloyd's Ave.
London, England

WORLD PETROLEUM

PUBLISHED BY MONA PALMER

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

VOLUME 16 | JULY, 1945 | NUMBER 7

CONTENTS

International Trade Problem — A New Approach Needed 35

Fueling the Fleet is Big APO Task in Pacific ... 36

Senate Committee's Study of Cartels 44

Elk Hills Unit Operation Reaches Goal 46

Operation Pluto — The Cross Channel Pipe Line 54

Russia Expanding Gas Production 56

Washington Notes 57

Oil Company Staff Changes 58

Rex. W. Wadman
General Manager

E. W. Mayo
Editor

J. C. Chatfield
Managing Editor

Sofie Cihowski
Assistant Editor

H. Arnold Jacobsen
Art Director

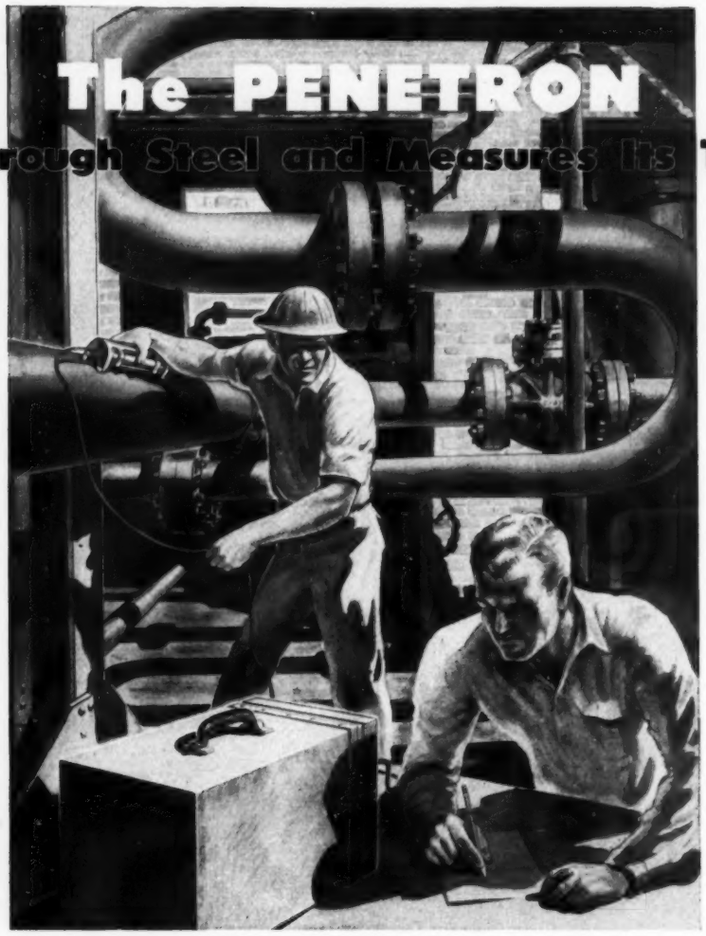
SUBSCRIPTIONS: Annual subscription is offered at the flat rate of $5.00 (U. S.) postpaid. Single copies are obtainable at 50 cents. • Address all correspondence regarding subscriptions to the publishers at Orange, Connecticut, or 2 West 45th Street, New York 19, N. Y. Address all correspondence regarding editorial and advertising matters at 2 W. 45th St., New York 19, (Tel. MUrray Hill 2-7333). Published by Mona Palmer Trustee under the will of Russell Palmer.

BRANCH OFFICES: London: Georgian House, St. James, London, S. W. 1 • Mid-Continent Advertising Manager: O. F. Cozier, 415 McBirney Bldg., Tulsa 3, Okla. (Tel. 4-5555) • Mid-West Advertising Manager: Willard R. Cotton 307 No. Michigan Ave., Chicago 1, Ill. (Tel. Franklin 2508) • Michigan Manager: R. F. Pickrell, 314 Stephenson Bldg., Detroit 2 (Tel. Trinity 1-0790) • Cleveland Advertising Manager: Frank J. Enright, Union Commerce Bldg., Cleveland 14, Ohio (Tel. Main 5693). Western Advertising Manager: Walter S. Johnson, 412 West 6th Street, Los Angeles 14, Calif. (Tel. Mutual 1391). Eastern Advertising Manager, Ralph F. Scholbe, 2 West 45th Street, New York 19, N. Y. (Tel. Murray Hill 2-7333).

EQUIPMENT IN WORLD-WIDE USE

The PENETRON

Looks Through Steel and Measures Its Thickness



THE PENETRON is an instrument which rapidly and accurately provides inspection data on lines, vessels and their contents without injury to the material being inspected. The PENETRON measures the thickness of any material from one side only, by use of penetrating gamma rays. It also determines the density of liquids, locates liquid levels or the interface between two immiscible liquids without access to the interior of the containing vessel.

Until the advent of the PENETRON, all the existing methods of inspecting materials have been time consuming, destructive, or have involved the use of cumbersome equipment. The PENETRON eliminates all existing difficulties by its extreme accuracy and portability, the complete unit weighing approximately 40 lbs. Designed by the Texaco Development Corp., the PENETRON has been licensed to Engineering Laboratories, Inc., as sole manufacturer and sales agent. Your inquiries will receive prompt attention.

Brochure on Request

Engineering Laboratories, Inc.

CONSULTING ENGINEERS & MANUFACTURERS

602-624 East Fourth Street Tulsa 3, Oklahoma, U. S. A.

EDITORIAL

INTERNATIONAL TRADE PROBLEM—A NEW APPROACH NEEDED

IF the inquiry which the O'Mahoney Senate committee is conducting on the subject of international trade is to be helpful to future American participation in such commerce a change in the atmosphere enveloping the early hearings is assuredly to be desired. Supposedly the purpose is to provide the basis for an international oil policy. Facts in regard to international trade agreements are germane to this subject and for determining the conditions under which American companies shall be allowed to participate in such agreements or whether such participation shall be discouraged or forbidden. The attitude assumed, however, by representatives of the Department of Justice who took a leading part in the proceedings appeared to be that the oil companies were on trial for past participation in such agreements. Representatives of the oil industry, being thus put on the defensive and undoubtedly bearing in mind former unhappy experiences in which they were criminally prosecuted for concerted action taken after advance approval by government authorities, appeared more concerned in justifying previous participation in international agreements than in presenting the full picture of their purpose and operation that might be helpful in dealing with the problem.

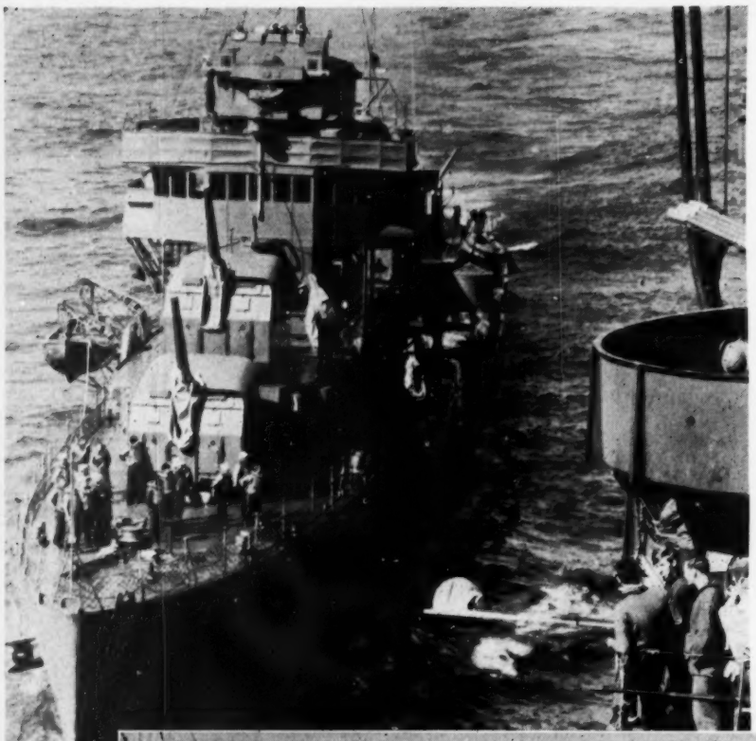
Unfortunately, the word cartel carries a sinister implication in the minds of the American people. It raises a picture of monopolistic practices, restriction of production and exaction of high prices. This feeling persists despite the fact that large sections of American industry have been forced to operate under particularly rigid cartel controls imposed by the government itself during the past decade. Such controls, embodying the most objectionable features of cartelization such as restriction of output, the imposition of quotas upon individual producers, limitation of the markets in which they can sell and determination of the prices which they shall receive, have been imposed by governmental authority. The position of federal officials who are responsible for these agreements in restraint of trade seems to be that cartels are iniquitous if run by commercial interests but are wholly praiseworthy if sponsored by governments.

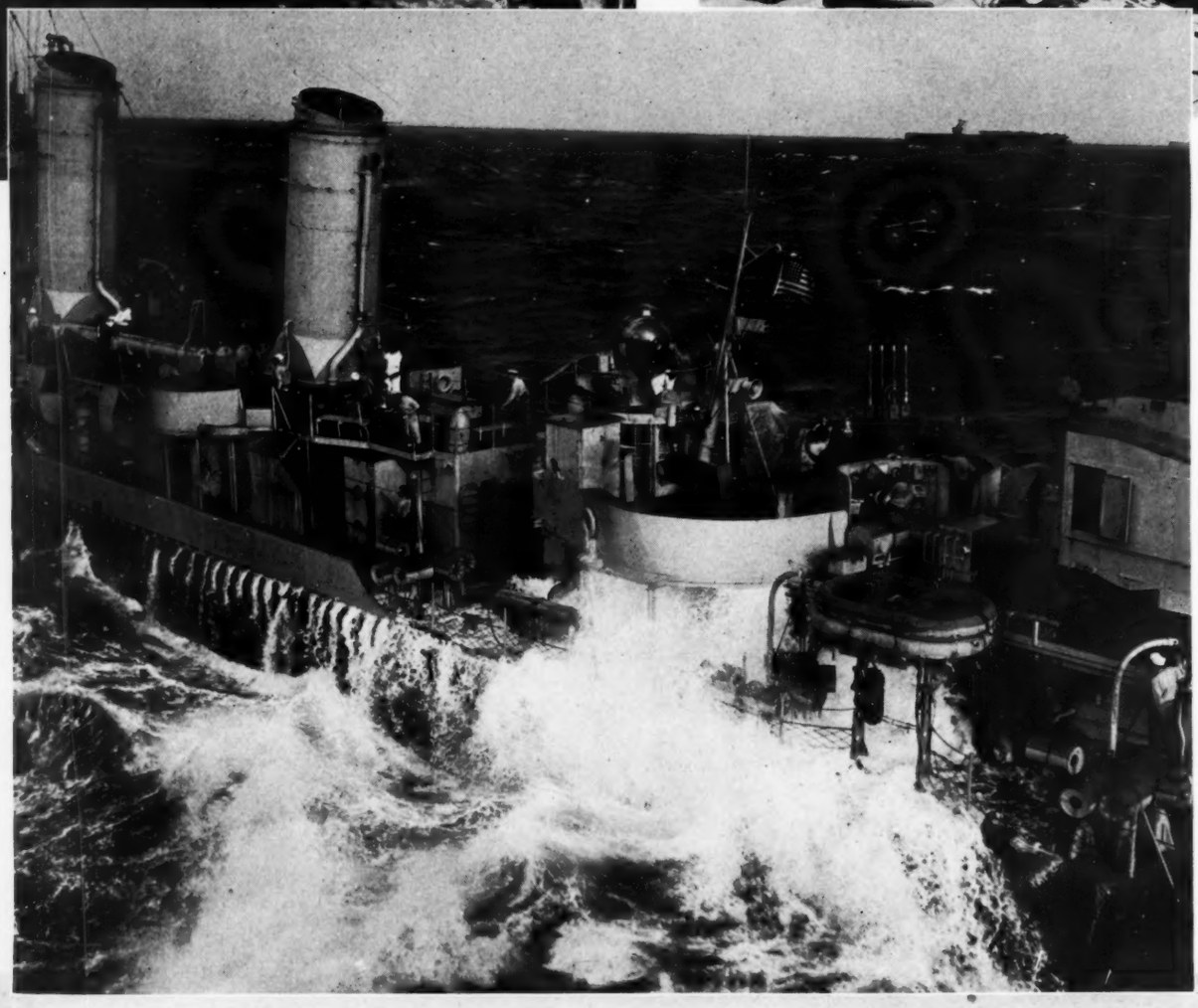
In other countries, including those which are the most energetic competitors of the United States for international markets, no such opprobrium attaches to cartels as among Americans. In most of these countries combinations of merchants and manufacturers not only have government approval but have the active backing of its political influence in the quest for export business. In areas and industries dominated by strong combinations traders of whatever nationality have had the choice of joining in these agreements or relinquishing all attempts to share in the business.

Members of the oil industry, who are representative in this respect of American industry as a whole, have made their position on this subject perfectly clear. They are opposed to cartels on principle. Their success has been built on active and strenuous competition. They are willing to take their chances in a fair field with no favors. If their government insists upon open competition, on equal access for all to raw materials and to markets for finished products they are prepared to accept that policy and to act upon it. But in that case it is the duty of the government to persuade other nations to collaborate in that policy and to make it universally effective.

Many international conferences dealing with political, financial and economic questions have been held during the past year or two. Many others are to take place in the immediate future. The lesson of all these is that no single government can hope to impose its will upon an entire group of other sovereign nations. The best that can come out of any of these conclaves is a series of compromises in the effort to reduce friction and to set up a system by which the peoples of the world can avoid mutual destruction.

Those who are most familiar with the conditions under which international trade has been conducted in the past and the close interest with which other governments foster its extension do not hope for an early or abrupt change in conditions. Granting the accuracy of their opinions a realistic consideration of provisions that will permit American companies to participate in foreign trade on even terms should be the first concern of those in official places. Much has been said and written of late regarding the critical influence of export business upon the prosperity of the United States in the post-war period. We are told that exports must rise to ten billion dollars yearly to insure full employment for American labor and reasonably full productivity for the industrial machine. During the war a wonderful illustration has been given of the effectiveness of team work between government and industry. Such cooperation is the only possible means by which a threefold expansion in export trade can be attained. That is the goal toward which the efforts of public officials and private industry alike should be directed.



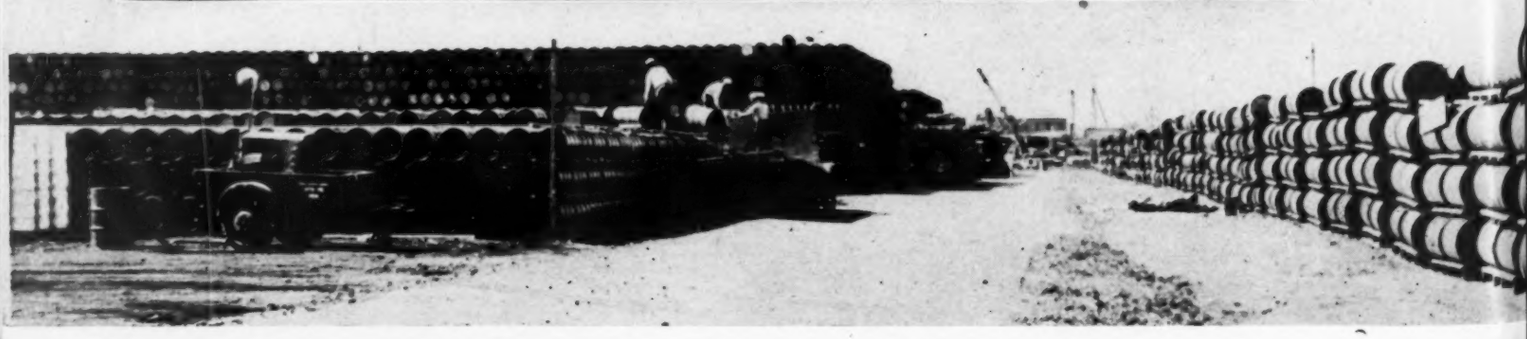


Top Left: Destr
Draws Up Along
Heavier Ship to Get
Rations of Fuel at

Top Right: Line H
Thrown to Cruiser
Preparation for Refu
Operation.

Left: Refueled "on
March" by Floating
Line.

Drum Recondition
Plant at Pearl Ha
Naval Supply Dep



War Correspondent Maddox

Heavy Seas Do Not Impede Oiler in Transferring "Lifeblood" During a Battle Mission.

FUELING THE FLEET IS BIG APO TASK IN PACIFIC

By William J. Maddox

Chief of World Petroleum's Washington Bureau

IT might sound grimmer to say that a "ring of steel" is being drawn tighter around Hirohito's neck, but to this correspondent, after covering more than 21,000 miles visiting advance bases in the Pacific theater, it looks as if the noose were fashioned of oil—mostly good American oil refined back in the States. And to see the enormous amounts of petroleum products of all kinds being used and the effective part they play in rolling the war closer to the Jap homeland makes oil seem a mighty grim weapon to be drawn around anybody's neck—a deadly noose when lighted. If I were the god-emperor, I'd hate the smell of petroleum.

Time and again during the trip the thought crossed my mind: If only some of the top Jap warlords could see this—some particular instance of the mounting tide of petroleum rolling against them, powering the attack of swarms of superforts, big naval task forces, landing barges, mechanized ground forces. It might shorten the war. Organize such a tour and show 'em the works, as the Navy did to me.

As American bases are pushed farther across the Pacific, however, transportation becomes more and more of a problem—a war against distance. As one officer I talked with put it: "With the Jap Navy now whittled down to where it can offer little effective opposition, our Navy has about finished its combat work, and the war now is entering on the transport stage."

Of course, this does not mean that the Navy is retiring from action—far from it. It does mean, however, that something new has been added. Oil not only has to be gotten to the combat areas in increasing quantities but in addition moved over increasingly longer hauls. More oil is consumed just to get the oil where it's needed. Very like pouring water from a boot with a hole in it.

In practically every place I visited, petroleum officers stressed earnestly the mounting requirements for petroleum products to keep the drive rolling westward. They are far from optimistic over the prospect of more than temporary hikes in gasoline ration allowances for civilian drivers back in the States as a result of V-E Day.

Some gasoline, they say, will have to back up in the states. But the states will serve only as a surge tank until the turn-around in transportation, from heading toward Europe to heading toward the Pacific, has been effected and Pacific requirements begin taking up the slack. Civilians at home, they say, should not get any foolish notions that the war is over so far as petroleum products are concerned. The period of comparative plenty for the A and B card drivers will be only an interlude.

To back this up, here are some figures given me to indicate the accelerated use of petroleum products in the Pacific, and from them may be pictured in some measure the rising curve that's ahead. Since the first quarter of 1944, consumption of fuel oil in the Pacific theater has jumped approximately 250 percent. Requirements for aviation gasoline have trebled. The same is true of diesel oil. And the use of motor gasoline (80-octane all-purpose and regular) has skyrocketed 600 percent.

To be more specific—as specific as security allows one to be—here are some figures revealed by Brigadier General Herman Feldman, Executive Assistant to the Assistant Chief of Staff for Logistics at CINCPAC headquarters on Guam. During a recent "typical" month's operations deliveries of petroleum products to the fleet and to Army and Navy shore installations in the area comprised 1,500,000 barrels of diesel oil, 8,000,000 barrels of fuel oil, 500,000 barrels of motor gasoline, 2,500,000 barrels of aviation gasoline, and 450,000 drums of miscellaneous products.

"As we get into the larger mass operations," the General said, as an augury of what is in the cards in petroleum requirements, "these figures will be dimmed by what is already planned for use."

From a petroleum officer in the forward area, Lieut. Clarence Wyatt, who in civilian life was head operator of California Standard's marine terminal at San Pedro and had completed twenty-one years with the company when he entered the service, I had this rueful comment: "When I

first came out in the Pacific, I thought we had done something pretty good when we gave the fleet 450,000 barrels of products for a single operation. But pretty soon we fueled another invasion to the tune of 800,000 barrels, and I thought that was tops. Since then I've lost all track of figures."

Fleet Admiral Chester Nimitz once put supplies in this order of importance—beans, bullets and oil. Since then he has revised the list. It's now oil, bullets and beans. And according to Rear Admiral J. J. Gaffney, Supply Officer for the 14th Naval District at Pearl Harbor: "Fuel is the crucial thing that a commander carries in mind. It is the key to the war."

Estimates on how high future requirements for the various products will reach, of course, are "out" for security reasons, but it can be said that they are big and are not expected to touch their peaks for some months yet. However, as far as aviation gasoline is concerned, it is pretty safe to assume that the 21,000,000 gallons a day produced in the states should be enough to put the military on easy street when the peak in that product comes.

Nerve center of the vast supply operations in the Pacific is located at Pearl Harbor, headquarters of the 14th Naval District and the Hawaiian Sea Frontier, which sprawls over thousands of miles of ocean. The district consists of all the islands of the Hawaiian group, as well as Midway, Kure, Johnston, Palmyra and other smaller islands. The fighting front has left Pearl far behind, and advance headquarters are now established under Admiral Nimitz, Commander in Chief of the Pacific (CINCPAC), on Guam. Owing to its location and fine harbor facilities, however, the 14th District has been and will continue to be the focal point of the war.

The main mission of the District is "to support the Fleet," and its major effort is devoted to that purpose. In this area men and ships are prepared for the battle fronts. Much that goes with an invasion of the Jap stronghold is staged through this great base.

In the dark days immediately following the Jap sneak attack, an extremely critical deficiency confronting the high command was lack of gasoline and oil storage facilities on Oahu, the island in the Hawaiian group that contains Pearl. Radical measures were imperative. A cooperative committee was formed with the local oil companies and one important result was that a considerable share, about 50 percent, of commercial storage capacity was converted to the exclusive use of the military. Then to utilize to the best advantage the limited storage remaining for civilian use, premium grades of gasoline were eliminated from the market, and strict gasoline rationing further cut civilian requirements.

Although the immediate oil storage shortage was critical, the future was not too black. Important projects had been planned long before December 7, 1941, and work was progressing rapidly on petroleum storage facilities that were soon to make the Pearl Harbor area one of the great gasoline and oil storage centers of the world.

And right here might be inserted a well deserved tribute to the Navy for the speed and efficiency with which it has carried on its construction work. At every base, some on islands that have been retaken from the Japs only a few months, I was amazed at the progress that had been made in clearing up the wreckage of the assault and in throwing up installations, building dock facilities, constructing roads, clearing and improving harbors, and scores of other undertakings necessary for efficient operation of a military station.

Control of Bulk Petroleum Products "Tanker Pipe Line" Flow to Pacific Areas.

'A'—Control point for diversion from Central Pacific to Pearl (West Coast Tankers).

'B'—Control point for diversion from Pearl to Central Pacific or South Pacific (West Coast Tankers).

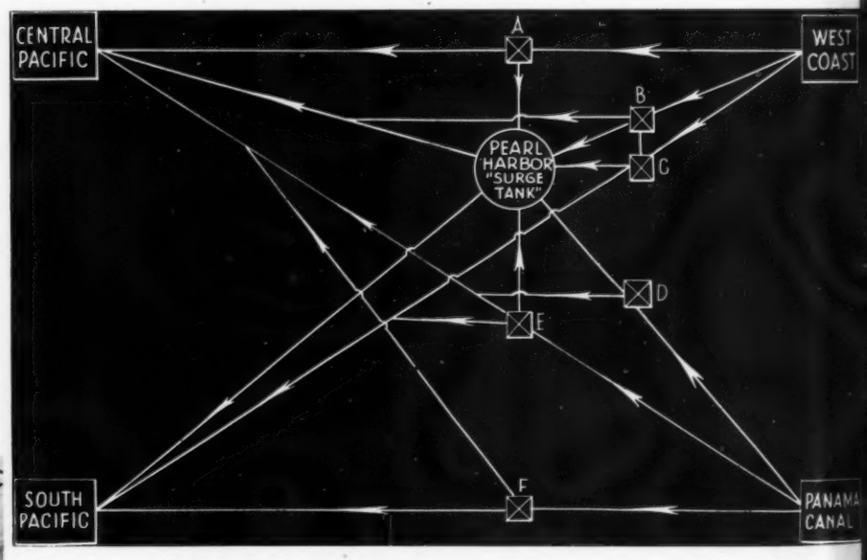
'C'—Control point for diversion from South Pacific to Pearl (West Coast Tankers).

'D'—Control point for diversion from Pearl to Central Pacific (Balboa Tankers).

'E'—Control point for diversion from Central Pacific to Pearl Harbor and South Pacific (Balboa Tankers).

'F'—Control point for diversion from South Pacific to Cenrtal Pacific (Balboa Tankers).

Note: Diversions of Balboa Tankers from Pearl to SoPac would normally be made in Balboa and hence are not shown in this diagram.



U. S. Navy Kingfisher Takes Aboard Gasoline from a Seaplane Tender.

Juicy Lucy — One of a Famous Pearl Harbor Fleet.

At the time of the Pearl Harbor blitz the Navy had under construction bomb-proof storage facilities that were about 10 percent completed. Since then, the project has been finished and is in use. Construction required some 3,000 workers, including 1,100 hard rock miners from the States. Total cost was in excess of $50,000,000. A complete system of pipe lines makes it possible to receive or discharge oil directly to tankers in the harbor.

Now, day and night, in teeming Pearl Harbor, tankers of the merchant fleet, many of them fresh from the shipyards, with pumps operating at capacity, supply oil and gasoline to the tremendous storages in the area on a scale that would have been thought fantastic in 1941. And, incidentally, harking back to the days of the old Elk Hills "deal", the storage tanks built by Doheny in exchange for Navy oil when Congress refused to appropriate money for the purpose, proved a veritable god-send. All the Navy knew then we'd have to fight Japan some day and they knew we'd need oil, but unfortunately the deal got tangled up with unsavory publicity. Navy's foresight and the value of these facilities have been amply vindicated by the vital service they rendered during the emergency.

Fuel Dump on Saipan, One of the Home Bases for B-29's Bombing Japan.

Before the war, 100-octane was delivered to the Hawaiian area in units of 400,000 and a maximum of 800,000 gallons. Today it is not unusual for two tankers with aviation gasoline cargoes to arrive at Pearl Harbor at the same time each with millions of gallons abroad. Fuel oil is delivered on an even grander scale.

The organization for the procurement and distribution of petroleum in the Pacific, with the exception of General MacArthur's Southwestern Pacific area, is centered in the Area Petroleum Office at Pearl. MacArthur has an APO organization of his own that looks after the requirements of his operations. An APO at Pearl was set up in January of this year and was the last one formed. It has the unusual function of being both a planning and an operating agency.

In command, as Area Petroleum Officer, Service Force, Pacific Fleet, is Captain Philip D. Lohmann, a Regular Navy man. Lohmann makes no pretense at being an oil man, but he does know logistics and has served as engineer officer on various ships. His job is policy making. "They just threw in a regular Navy man," he explained to me with a laugh, "so there'd be somebody who could battle it out with other Navy men on an equal footing."

Lohmann is the direct representative of the Army and Navy Petroleum Board, the over-all logistics organization for oil at Washington that operates under the Joint Chiefs of Staff. As APO he is responsible for supplies of all packaged and bulk fuels in the Pacific area, exclusive of MacArthur's sphere of operations. This includes both the Army and the Navy. They draw from a common pool, and one of the important steps that has made this possible is their agreement on uniform specifications for products. Lohmann has control of all merchant tankers—company vessels operated under the War Shipping Administration — involved in delivery to the forward area.

Although he himself is not an oil man, Lohmann's headquarters at Pearl is staffed almost 100 percent with men who have had plenty of industry experience back in the states. Even on the remote island stations under his control are company men applying their peacetime knowledge of oil to the problems of wartime logistics.

At his right hand is Commander George C. Shepherd, Jr., USNR, research engineer with the Union Oil Company since 1927. As APO Executive Officer and Planning Officer, Shepherd sparks all the big plays. He knows where the oil is and gets it to where it's needed—if he has to squeeze it out of a hat. A graduate of Harvard and the United States Naval War College, Shepherd has been in the Naval Reserve since 1928. He was called to active duty October 1940 as a member of the Fifth Organized Naval Reserve Division.

Shepherd would make the job of "backing up the Fleet" sound rather simple. But after you have talked with him a while, as well as with APO representatives scattered around at the island bases and depots, as to what actually is involved, you realize that it takes a whale of a lot of know-how and daring old American ingenuity to meet the shifting problems that explode in your face every day. Lohmann told me with excusable pride: "We have never kept a ship from sailing because of lack of fuel". Well, it has taken a lot of these two ingredients to make that record and to keep it clean.

A notable instance of what can happen that he told me of was Admiral Halsey's strike at Indo-China. "Suddenly Halsey saw the screen door was open and he went in. That was something nobody could anticipate. We had no warning. But we had to back him up with oil. As a result he raised particular hell with our oil logistics. He caused the oil pipe line flow to dam up in the merchant tankers and upset turn-around time all over the place. But you can't quarrel with that. When they see the chance they've got to strike."

As the Army's representative at APO headquarters at Pearl to look after the needs of the Army Air Force, is Lieut. Col. William J. Worcester, USA, Assistant Deputy APO and AFPOA liason. He is a graduate of West Point and originally was commissioned in Coast Artillery. Formerly he was stationed in Trinidad,

Lower Left: Empty Gasoline Drums Support Submarine Pipe Line During Assembly.

Fueling One of the Big B-29's of the XXI Bomber Command Based in the Marianas.

Chief Storekeeper Donald A. Grubb *Lt. (jg) Hollis E. Jones* *Lt. Comdr. George A. Ritchey* *Lt. Comdr. Donald L. McCuen* *Lt. Col. William J. Worc*

British West Indies, and was assistant APO for that area particularly charged with AAF petroleum logistics.

As a necessary part of "backing up the Fleet", APO keeps a constant finger on how much products of various kinds are available at each of the many depots and stations throughout the area. It also estimates future needs, even down to individual ships, and includes requirements for oiling forthcoming strikes against the enemy by land, sea and air. As General Feldman puts it: Logistics is the strong right arm of strategy—to determine the support necessary to sustain operations. Impending moves against the enemy should, of course, be known well in advance of the operation, and here is one place where the vast distances to be covered in laying down supplies is such a tremendous factor to be reckoned with. The oil must be laid down at the right spot at the precise time.

Weekly reports are gathered from all depots and bases in the Pacific area, as well as comprehensive monthly figures on inventories. Based on these and the planned future operations, monthly estimates of requirements are made up and forwarded to the Army and Navy Petroleum Board at Washington, which makes requisition on the Petroleum Administration for War for the amounts of products needed, and from here the industry gets the word on what is expected of it. Requirements of products in bulk are estimated by APO four months in advance of use. Packaged products are estimated five months ahead.

Estimating requirements for aviation gasoline, APO officers told me, is not such a big problem, as they know approximately the consumption per plane and per operation. But estimating fuel needs for surface craft is a different story. With these, the speed of the combat vessels makes a big difference in the amount of fuel consumed. Captain Lohmann, out of his engineer-experience, gave me a formula that probably is commonplace to an engineer but it was startling to me as to the relation between speed and consumption. That is, that consumption increases as the cube of the speed.

As an illustration, he mentioned the saving of fuel effected by a recent order cutting down the cruising speed of ships four knots—1,000,000 barrels of fuel oil. The size of this saving in itself gives some idea of the vast amounts of oil required to keep the fleet on the prowl, not to mention the big spurts that come when economy is thrown to the winds and "flank' is the order.

One type of craft, the LST's, it seems can raise particular hob with supplies in storage. They have a huge capacity for fuel in terms of daily consumption, and when a few of them casually drop into a port and say "fill 'er up" it puts a big unpredictable drain on supplies at that point. But such occurrences are just incidents in the day's work of the supply men and just adds another item that keeps them on their toes balancing the flow of products to the forward areas.

As far as possible petroleum supplies go to the forward area, where they will be nearer the scene of operation and the most speedily available for use. Pearl, with its vast storage facilities, is the "surge tank." I was cautioned against considering such oil stored at Pearl as a "reserve." Rather, it is a "cushion" that makes it possible for the planners to keep the movement of products fluid and prevent feasts and famines from developing at supply bases farther along the line toward the forward area.

This effort at flexibility is carried farther by a system of diverting the "tanker pipe line" flow from the West Coast and Panama Canal while the loaded merchant tankers are enroute to their destinations in the Pacific ocean area. At certain roughly designated points they can be diverted to Pearl to discharge their cargoes or can be switched from Pearl to another station farther out where storage is available.

Incidentally, the tankers are sent out with assorted cargoes, not all 100-octane or fuel oil or diesel or motor gasoline. This is a precaution against a shortage occurring in any one product, if a tanker is lost enroute from the states. Many tankers that touch at Pearl do not discharge their oil there. They come out with deck loads of other supplies for the military, and after these are taken off they proceed with the oil to one of the forward bases.

As a rule, the merchant tankers do not go up into the combat areas. They discharge their loads back of the danger zones, and from there the job of carrying oil forward is done by the fleet oilers, those phantom ships that are doing such effective work fueling the Fleet wherever it happens to be. Theirs is a story by itself—one that I hope to tell in next month's issue.

Figured on the basis of an average turn-around of 55 days for a merchant tanker between the West Coast and the Mariannas, of which Guam is the principal island, it would require about 100 to maintain a flow of 110,000 barrels of products a day into that area. A tanker thus is good for about five and a half trips a year under present conditions. Every effort is being made, however, to reduce the turn-around time in order to handle the mounting volume in prospect.

As some indication of the size of the order for products in the Pacific campaigns, here are a few figures on what it took to stage the Mariannas operations, during a nine-week's period from June 9 to August 11, 1944. D-Day was June 5, on Saipan, but fleet units approached the target area several days in advance.

This campaign involved more than 600 ships and nearly 300,000 Navy, Marine and Army personnel, who were more than 1,000 mile from our nearest base, and approximately 6,000 miles from the United States. Petroleum operations involved the use of 24 Navy fleet oilers, which, in turn, were supplied by War Shipping Administration tankers. The fleet oilers shuttled back and forth between the Fleet, fueling at sea.

Nearly all of the fuel and diesel oil for this operation came from the Netherlands West In-

Capt. Philip D. Lohmann *Comdr. George C. Shepherd* *Brig. Gen. Herman Feldman* *Lt. Howard M. Rossell* *Lt. Paul A. Best*

dies, whereas the gasoline came from the West Coast. Somewhat over 100 T2 tanker loads of bulk petroleum were required for this operation. Approximately 9,000,000 barrels of fuel oil, 30,000,000 gallons of aviation gasoline, and 700,000 barrels of diesel were required.

In addition, more than 200,000 drums of fuels, lubricants and greases were consumed as lubricants in the Fleet, in airplane engines or by the land-based forces. These figures do not include the requirements for the Pearl Harbor area, bunkering of merchant vessels in the forward area, or requirements in the South Pacific.

In a landing operation petroleum products needed for the initial stages of the fighting go ashore packaged in 55-gallon drums—a container that has become, by the way, probably the most versatile gadget in the whole Pacific area, much to the chagrin of the petroleum officers. Some of the drums are floated ashore, others brought in with the landing craft.

But as soon as enough of a beachhead has been established, the construction men swarm ashore, while the battle is going on, and begin throwing up 1,000-gallon "quick-up" storage facilities. When all is ready, a pipe is run out over the reef so that the fleet oilers can take up the job of filling the tanks. Units are then ready to begin dispensing oil to the ground forces, and the handling of products becomes a bulk operation, with tankers unloading directly to shore storage.

Ninety percent of the packaging of petroleum products is done on the Pacific Coast. Lubes and specialty products, such as fog oil used for throwing out smoke screens, kerosene for stoves and lamps, and white gasoline (60-octane unleaded for stoves and other non-automotive purposes) are handled in drums. There are several drum filling depots at Pacific bases and more are planned.

An important drum filling operation for motor gasoline is carried on in connection with drum reconditioning at the Waimalu plant in the Ewa Junction area at Pearl. This is the only drum reconditioning plant west of the Pacific Coast, but it is expected that another will shortly be established at Guam.

The plant area covers about 240 acres and serves as storage for vast quantities of drummed products, including 100-octane, lube oil, fog oil, diesel oil and all kinds of gasoline. From here much of the fuel for the initial attack forces is supplied. After the beachhead is established and fuel can be handled in bulk, it is up to the tankers to power the operations.

In charge of the reconditioning plant and its supply operations is Lieut. A. J. Young, USNR, who in civilian life was with the Frontier Fuel Oil Company of Buffalo, New York. In all he has been in the oil business for a quarter of a century, and previously to his 10 years with Frontier was with the Tide Water. Associated with his other duties, Young also runs a fleet of tank wagons that distribute motor fuel to the military stations on the island of Oahu.

So important is the area under Young's command that it is under constant guard and at night silent attack dogs with marines patrol the area. Each dog is acquainted only with its handlers, two Marines, and it takes about three months to train one. Young also has his own fire fighting outfit. Fire drills are held every Sunday after inspection.

Some idea of the size of the Ewa Junction plant can be had from the fact that it holds about 1,000,000 drums. The filling equipment, which is automatic, can load 2,000 drums each shift, and is fed by a pipe line from tankers at the dock. The extent of the packaged goods business may be judged from a month's operation which totaled some 25,000,000 gallons—comprising 15,000,000 gallons of diesel oil, motor gasoline, white gasoline, kerosene and some aviation gasoline, and about 10,000,000 gallons of lube oil.

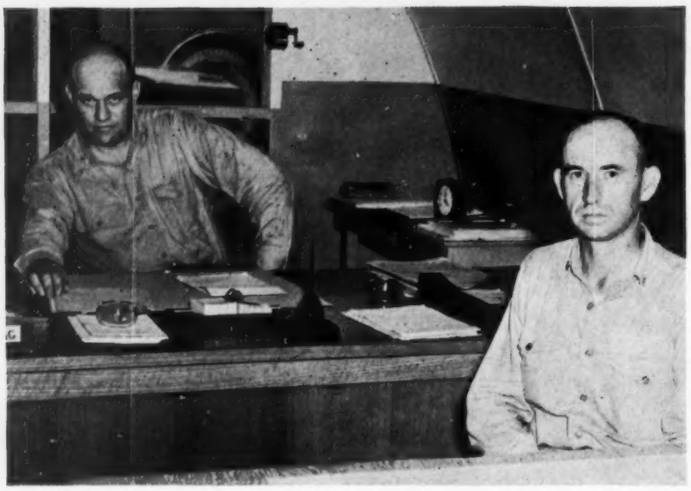
In the short time since it was "secured"—August 9, 1944—Guam has forged to the front as one of the big petroleum supply jobs in the Pacific. On September 17, the Fuel Section of the Naval Supply Depot took over the operation of all fuel dumps from the Fifth Field Depot (Marines) and assumed responsibility for supplying all forces ashore, afloat and in the air based on Guam as well as combat and merchant vessels that call at Apri Harbor. From that date the Section was responsible for requisitioning, stowing, issuing and maintaining records of all fuels and lubes on the Island.

Two men, former oil men from the States, who have been with the job from the first and are still carrying on in their respective lines are Lieut. Comdr. Sid Goldin, formerly with Shell as an assistant division manager in New York, and Lieut. Watson J. Grumm, a construction engineer with California Standard. Goldin—then a Lieut. (jg)—came ashore with fifteen enlisted personnel to take charge of all fuel supply, and Grumm as Seabee planning officer in charge of construction of petroleum installations.

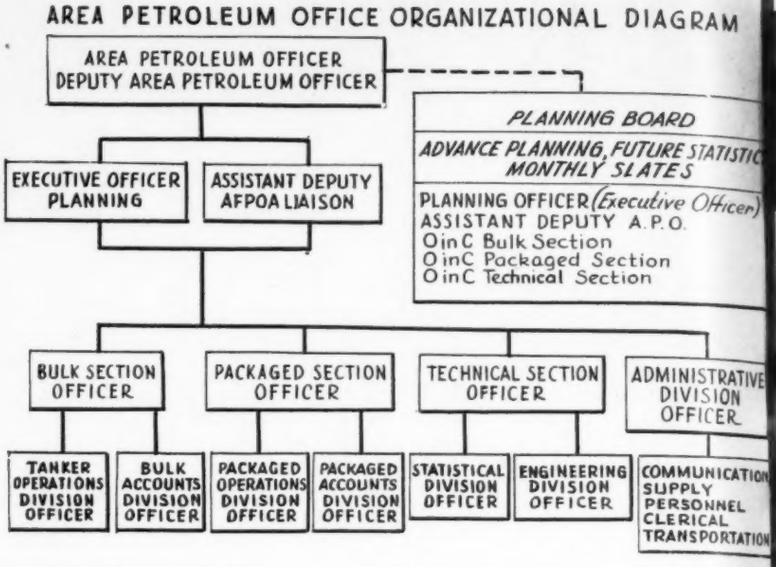
Thanks to the Seabees—pipeliners and roustabouts from the States—under Grumm's supervision, a tank farm system was put into operation October 20 and the first tanker arrived to discharge 100-octane. From these first tanks has grown a system consisting today of some 50 miles of pipe lines, 18 booster stations, 15 tank farms, and a drum storage area that covers about two and a half square miles.

In addition there are fuel docks for receiving and issuing fuel. When completed, the pipe line system will measure some 95 miles, largely to keep pace with mounting needs for aviation gasoline. The pipe ranged from four inches up in size. Four lines connect with the docks and two 8-inch submarine lines, each about 4,000 feet long, reach out to deep water beyond the coral reefs. The first of the submarine lines was completed in time to fuel the first B-29 of the XXI Bomber Command to strike from Guam at the Jap homeland.

Considerably more than 2,500,000 barrels of bulk



Lt. Comdr. S. Goldin and Lt. Comdr. W. W. Craig in Their Quonset Headquarters at Guam.



products have been received and stored by Goldin's fuel section since the first tank farm was established. This gives some idea of the size of the oil operation on Guam. In addition, about 500,000 drums of products were received and more than 2,500,000 pounds of grease. In view of the stepping up of activities against the Japs, it would not be too much to expect that these figures will be tripled.

The Fuel Section is responsible for fueling the fleet and operates oil barges, station tankers and a seaside service station. The latter is used for the fueling of small craft. Goldin's office maintains constant communication with ships in the harbor for scheduling fuel requirements and providing necessary lubricants. It is estimated that approximately 150 dispatches are handled each day of all types, and the rule is that no request goes unanswered for more than 15 minutes.

As a further service to the Central Pacific, a Petroleum Testing Laboratory, headed by Lieut. Comdr. W. W. Craig, formerly with Gulf refining and technological division in Philadelphia, is about to go into operation. Products will be subjected to standard tests to determine their quality both upon arrival and after storage.

To conserve shipping space a drum refilling and reconditioning plant is to be erected on the island in the near future. Thousands of empty drums will be reconditioned and refilled for forward shipment. They will come from all over the Central Pacific.

In the operation of the tank farm system every precaution is taken to assure the receipt of uncontaminated products. All tanks are tested for water daily and samples are submitted for analysis. A constant watch is maintained over all pipe lines. Linemen walk through miles of jungle area alert for sabotage and normal breaks.

On Guam, the direct representative of the APO at Pearl, is Lieut. Comdr. Donald L. McCuen, who is attached to the staff of the Commander Forward Area. As such he is responsible for estimating future petroleum requirements of all military activities based in the Marianas, to which Guam belongs, the Western Carolines and on Iwo Jima. Goldin reports the Guam requirements to him.

From Their Floating Office Aboard a Tanker in the Western Pacific, These Men of Service Squadron 10 Back up the Fleet with Fuel and Lubricating Oils. Kneeling Left to Right: Lt. (jg) Thomas J. Nagle; Lt. (jg) Clarence Wyatt; Lt. Frans E. A. Widen; Chief Warrant Officer Byrd W. Coolidge; Lt. James W. Duncan. Middle Row: Lt. Lawrence V. Maher; Chief Pay Clerk Thomas Q. Gordon; Lt. Comdr. Carl T. Munson; Lt. Griswold S. Hayward. Rear Row: Pay Clerk W. E. Click; Lt. Newell C. Loomis; Ensign John C. Kehrli; Lt. Albert Pierce, Jr. and Comdr. John W. Howe.

In civilian life before entering the service, McCuen was with the New York office of Tide Water Associated, and previously was with Pan American Petroleum and Transport in Mexico and South America. Before coming to Guam he was on duty with the APO for the Caribbean defense command at Balboa, and later with the APO at Pearl. With him now is Donald A. Grubb, chief storekeeper, who is serving as an oil accountant. Grubb was formerly with the production division of Gulf at Houston, Texas. He put in 16 months aboard a fleet minesweeper and participated in the invasions of Tarawa and Kwajalein.

The Pacific is full of veteran oil men from the States. Some have been out there for many months, and it need hardly be said that they have their wistful moments. But each and every one of them is on the ball all the time and takes a rightful pride in the job he is doing, determined to stick it out till the Japs are smothered in oil. Getting back to Pearl, here are some in-

Lt. L. Lowrey, and J. Dimeling Jr., at their Desks in Naval Fuel Supply Depot.

Lt. A. J. Young Overseeing an Operation at Drum Conditioning Plant.

dustry veterans who are handling key jobs under Captain Lohmann in the Area Petroleum Office: Lieut. Comdr. George A. Ritchey, Officer in Charge of the Bulk Section, including supervision of Tanker Operations. For 14 years he was with Atlantic Refining as assistant superintendent of the Operating Division. Before coming to the Pacific, Ritchey used his know-how in the European theater as Tanker Operations Officer.

Lieut. Paul A. Best, when I visited Pearl, was due to leave shortly to be Senior Fuel Officer in Saipan. He is on leave from The Texas Company. In service since March 1943, Best was on duty with the Army and Navy Petroleum Board at Washington, then in North Africa and Italy, and with WSA in Washington. He also served with PAW.

Lieut. Howard M. Rossell is Petroleum Products Operations Officer. He is on leave from General Petroleum of California where he served as assistant operating manager for 15 years. He has been in service since early 1944 and was with Service Squadron TEN during the Marianas campaign.

Lieut. (jg) Hollis E. Jones, Tanker Operations Officer, was with Sun in New York for 10 years as assistant plant superintendent. He served in southern France as fuel operations officer.

Lieut. Edward M. Winslow, Packaged Products Officer, was with Sun 16 years as Office and Credit Manager. He has been in service since September 1943, and previously was Assistant Fuel Officer in the South Pacific.

Lieut. (jg) Richard W. Baldwin, is leaving APO Pearl to become Staff Petroleum Operations Officer in the Marianas. He was with Shell 15 years in the Boston Operations department, and entered the service in June 1943 as Supply and Tanker Coordinating Officer with the Army and Navy Petroleum Board.

Ensign Joseph B. West, Packaged Products Officer attached to the Marianas staff, was junior engineer with Eastern States Petroleum of Houston, Texas. Store Keeper 1c Carl J. Laskow, of APO's tanker operations division, was with Shell 19 years in the shipping and traffic department at Wilmington, California, handling all phases of shipping petroleum products.

One of the most interesting operations in the Pacific is that of supplying the B-29s operating from the XXI Bomber Command bases in the Marianas, which includes Guam, Saipan and Tinian. Aviation gasoline, of course, is the big item but a sizeable business is done also in aviation lubes. As large as these requirements are today, they are mounting rapidly and the lid is on as to what these requirements will be when they reach their peak.

The planes at one of these bases are serviced from two dispensing points on the field, each of which is capable of dispensing 50,000 gallons an hour. The Wing at this base is equipped with ninety six 2,000-gallon capacity refueling units. The average amount of gasoline used per mission per plane by this Wing is 6,000 gallons. The largest amount used on one mission by the entire Wing was 960,000 gallons, and the largest amount for any one month was more than 10,000,000 gallons, when the Wing flew a total of more than 4,250,000 air miles. The largest amount of aviation gasoline dispensed in the shortest period of time was on a day in March of this year when approximately 1,000,000 gallons was dispensed in 13 hours.

Battling the enemy behind the fighting front is a small but mighty fleet, called the "Juicy" fleet, that sails about Pearl Harbor reclaiming the oil that scums the water. Chief object of the fleet is preventing fire, clearing oil atop the water to eliminate a dangerous hazard, but the by-product of the operation is oil salvage. The returns practically finance the maintenance of the "Juicies". There are four of these units—Juicy Lucy, Juicy Suzy, Juicy Floozie, and Juicy Scoopie.

Besides removing the threat of conflagration, the Juicy fleet units last year scooped from the harbor some 3,000,000 gallons, 40 percent of which was reclaimed oil. The salvaged "black gold" is used chiefly for oiling roadways throughout the Naval establishments. A portion of it, however, is also utilized in power plants in the Navy Yard.

Fighting ships of the Pacific Fleet, while undergoing maintenance, relax in safety, in the harbor as the "Juicy" units maneuver about scooping the oil into a large tank, the water going to the bottom and the oil passing through the reclaiming process. Experiments continue and the fleet may develop into something even more effective, although Navy officials are highly pleased with accomplishments to date.

AREA PETROLEUM OFFICE
SERVICE FORCE, PACIFIC FLEET
ASSIGNMENT OF OFFICERS, AREA PETROLEUM OFFICE
26 APRIL 1945

Area Petroleum Officer	Captain P. D. Lohmann, USN
Deputy Area Petroleum Officer	Captain L. A. Puckett, (SC) USN
Executive Officer	Comdr. G. C. Shepherd, Jr., USNR
Asst. Deputy Area Petroleum Officer	Lt. Col. W. J. Worcester, AC, US ARMY
Officer in Charge Bulk Section	Lt. Comdr. G. A. Ritchey, USNR
Tanker Operations Division Officer	Lt. (jg) H. E. Jones, USNR
Tanker Operations Division	Lt. (jg) B. R. Pfretzschner, USNR
Bulk Accounts Division Officer	Lt. Comdr. R. W. Smith, (SC) USNR
Bulk Accounts Division	Lieut. L. S. Kelley, (SC) USNR
Officer in Charge Packaged Section	Lieut. R. D. Skinner, USNR
Packaged Operations Division Officer	Lieut. H. M. Rossell, (SC) USNR
Packaged Operations Division	Capt. W. E. Regan, QMC, U. S. ARMY
Packaged Accounts Division Officer	Lieut. E. M. Winslow, (SC) USNR
Packaged Accounts Division	Lt. (jg) J. I. Munyan, (SC) USNR
Officer in Charge Technical Section	Maj. W. C. Niederluecke, GSC, US ARMY
Statistical Division Officer	Lt. (jg) G. H. Buckwald, USNR
Administrative Division Officer	Lt. (jg) R. M. Cole, USNR

Senate Committee Appearing at Hearing—Left to Right: Assistant Attorney General Wendell Berge; Senator Wiley of Wisconsin; Henry Fraser; Senator O'Mahoney of Wyoming; Senator Moore of Oklahoma and Senator Smith of New Jersey.

SENATE COMMITTEE'S STUDY OF CARTELS HAS NOT GRIPPED REALITIES OF PROBLEM

By Ruth Sheldon

A very important patient with a mysterious ailment entered a Washington clinic during May to begin a series of examinations. The doctors probed experimentally, but postponed making their diagnosis until the case history could be studied more thoroughly. The patient was American foreign trade; the clinic was the joint session of the O'Mahoney Senate Committee Investigating Petroleum Resources and a sub-committee of the Senate Judiciary Committee. The specialists called in on the case were from government and the petroleum industry.

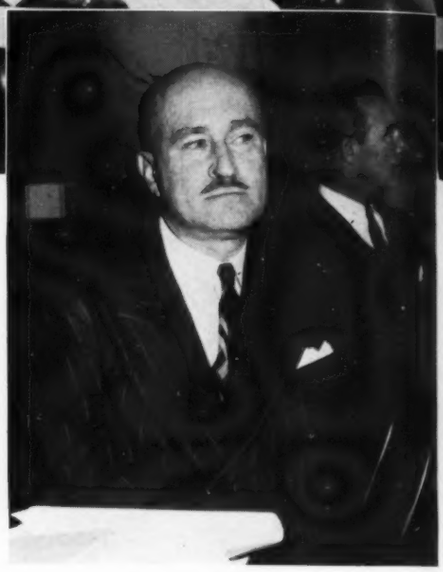
The specific matter under consideration was the O'Mahoney bill to require registration with the Department of Justice of foreign contracts in which American corporations participate and the witnesses ostensibly restricted themselves to discussion of the bill. However, these discussions and those of subsequent committee hearings will attempt to chart the course of what United States policy on international cartels should be, particularly in reference to the oil industry.

There was a tense undercurrent to the hearings for the principal problem which faces the American oil industry today, as well as every other industry engaged in foreign trade, is how to do business abroad without the fear of being prosecuted at home under the Sherman anti-trust law. The hearings which occupied the time of the first sessions made it clear that it is going to be extremely difficult to create the favorable atmosphere needed for a constructive discussion between government and industry on how to solve this problem.

In order to formulate a workable policy it is necessary to consider not only present conditions but the methods by which international trade has been conducted in the past. The oil industry is handicapped in a presentation of this sort, for although to date it has not been prosecuted for its activities abroad and it is of the opinion that it has not violated the anti-trust laws, what the industry believes is no guarantee that the Department of Justice entertains the same opinion. The industry conceivably could be placed in the position of laying itself open to indictment on testimony involving the past which it would be voluntarily offering in order to avoid being indicted in the future.

This dilemma was brought out clearly in the industry's refutation of the testimony of Assistant Attorney General Wendell Berge, in charge of the Department of Justice anti-trust division.

Berge discussed in great detail the pre-war cartel arrangements between Standard Oil Company (New Jersey) and the German I. G. Farben, emphasizing the disadvantages to the national welfare which resulted. He pointed out that he recognized that today there is a willingness on the part of many companies to face these problems and to cooperate. "However," he said, "the past record cannot be overlooked in any frank study such as this."



Laurence B. Levi

When Berge completed his testimony, Orville Harden, vice-president of the Standard Oil Company (New Jersey) immediately made a formal statement that the company entirely disagreed with Berge's interpretations of what it did or intended to do. "I don't think there is any point in again going into a lot of details," he said, "but I am glad that Mr. Berge has brought it up, because it raises the question as to how an American business man in the future could solve the type of problem which confronted us in 1929 without subjecting himself to official criticism more than ten years after the event".

The atmosphere of the hearings was that of a courtroom and, unfortunately, industry witnesses gave the impression they were on the defense. They were so intent upon not deviating from the exact phraseology of their statements, which had been carefully prepared by their lawyers, that they found it exceedingly difficult and in some cases impossible to adequately answer questions asked by committee members and the various government witnesses.

The industry witnesses had been chosen to represent a cross section of oil companies engaged

Terry Duce Discusses World Oil Supply.

Orville Harden

W. S. S. Rodgers

in business abroad; Orville Harden, vice-president, Standard Oil Company (New Jersey); W. S. S. Rodgers, chairman of the board, Texas Company; Laurence B. Levi, vice-president, Socony-Vacuum Oil Company; and Terry Duce, vice-president, Arabian American Oil Co.

These witnesses built up a picture of the important position of the American oil industry in foreign areas. They explained that due to the laws of many foreign countries they had been forced to enter into cartel agreements abroad in order to do business. They recommended that if the United States government wished to eliminate monopolies and cartels it should reach voluntary agreements among all nations to do so. In the meantime, American anti-trust laws should not be applied to transactions in other countries.

Levi summed up the industry's position by saying, "If American concerns are not permitted the same freedom of action as their foreign competitors to operate in accordance with the laws and customs of foreign countries, regardless of their merits, it might result in the loss of important lines of American foreign trade."

It would seem that the only way to solve the problem is through introduction of a bill designed to set up a specific yardstick of what should and should not be exemptions to the anti-trust laws in regard to foreign trade. Hearings on such a bill would provide the opportunity to thoroughly discuss the problem in all its details rather than to skirt the edges of it as was done during these hearings.

Discussion of the present O'Mahoney bill is not an adequate vehicle for solving the issue at stake. The O'Mahoney bill grants neither cartel immunity nor sets up cartel control. It is merely a mechanism to give the American people full information on the agreements which affect its foreign trade.

The area of agreement between the Department of Justice and the oil industry even on this bill is not large. Attorney-General Biddle and Assistant Attorney General Berge endorsed the bill as a first step in avoiding the cartel road, stating that they believe cartels will find it difficult to operate if the agreements upon which they are based are open to public scrutiny. The oil industry, on the other hand, considers the bill "objectionable", according to W. S. S. Rodgers, "because it further complicates an already complicated situation."

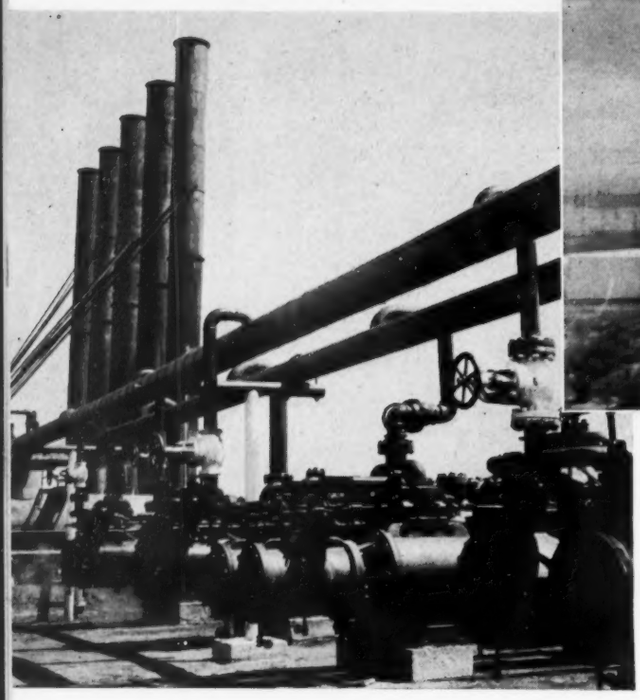
Rodgers stated that the bill would place American nationals at a disadvantage in foreign markets with respect to their foreign competitors by making American commercial information public. He predicted that an international reporting service would be organized in Washington to flash this information quickly to interested business men throughout the world. He further saw the bill as an attempt to extend United States anti-trust laws and police power to foreign countries irrespective of the legality of a company's actions under the laws of those foreign countries.

Proof that this problem of reconciling foreign trade with the anti-trust laws must be handled by a direct approach is amply offered by the recent controversy over the revision of the Anglo-American oil treaty, soon to be sent to the Senate. Industry vigorously sought to insert a clause in the treaty providing that any actions taken as a result of the treaty and upon government recommendation would have anti-trust immunity. Although it was generally agreed that such a clause would have no real standing under constitutional law, it would at least have established a precedent of intent to undertake formal action to reconcile the anti-trust laws with the terms and purposes of the treaty.

A very real struggle developed over insertion of of this clause with the Department of Justice and the Department of State opposing it and Secretary of Interior Ickes and the oil industry urging its inclusion in some form. Such a deadlock ensued that the issue was finally dropped, leaving the whole problem not only where it was in the first place but intensifying the necessity for a realistic approach. As one prominent member of the industry commented "Oil treaties will be able to accomplish nothing until this problem is solved —for even if a treaty is signed the industry cannot be forced to act under it and the industry will not act as long as there is any doubt as to what its position would be in regard to the anti-trust laws."

When a realistic approach to the problem is decided upon and put into action, the cartel hearings just concluded will provide an object lesson to industry. Industry members attending the hearings realized that this opening presentation of industry's case was not as effective as it should have been and the impression created was not particularly favorable. The problem is real, complicated and urgent. Industry has an important and sincere case to make.

A more vigorous and able presentation must be worked out in order to prove what industry can and should be able to do in post war foreign expansion.



Left: Steam Shipping Pumps—Boilers in Background.

Part of 637,000 Barrels of Storage Capacity at Naval Fuel Annex.

ELK HILLS UNIT OPERATION REACHES GOAL AHEAD OF SCHEDULE

By Nicholas A. D'Arey, Jr.
Charles W. Carter Company

THREE months ahead of time in the drive to get 65,000 barrels of oil per day for the United States Navy is the proud record of production at Unit Operation-Naval Petroleum Reserve No. 1, more commonly known as Elk Hills. In the nine months since the operating agreement was approved by the President of the United States 50,000 additional barrels per day of new production has been obtained. This oil is especially suited for refining into fuel oil for our ships of the sea and high octane gasoline for our ships of the sky.

Elk Hills has developed in a slow and orderly manner since Standard Oil Company of California brought in Hay No. 1, the discovery well, in January 1919. The wealth of geological information accumulated since that time has helped make it possible to meet the present demand for oil. It was not until the shortage of crude oil became critical that this sleeping giant was aroused by the combined action of the Joint Chiefs of Staff, Congress and the President.

The goal of 65,000 barrels production daily has been attained far ahead of schedule due to the combined efforts of the United States Navy and the Standard Oil Company of California as joint operators, aided by over 15 drilling contractors, numerous service organizations and oil field supply houses. This joint operation under the supervision of Captain Harry P. Stolz, USNR, and Victor O. Wankowski, Standard of California, is one of the smoothest possible working teams composed of both naval and civilian personnel.

Oil was discovered in 1910 in the Midway-Sunset oil field on the west side of the San Joaquin valley. Intense development and exploration spread to near by structures including Elk Hills. Between 1910 and 1919 approximately 35 wells were drilled in the Elk Hills area but none of them became successful commercial producers. In January, 1919 Standard of California completed its Hay No. 1 discovery well in what is now the central section of the Naval Reserve. This well produced 225 barrels of 37.2 gravity oil per day from a depth of 2532 feet. In February, 1920 Standard completed Tupman No. 1, the second producer in Elk Hills, for 5200 barrels daily. This well was almost six miles from the discovery well and was the first well completed outside the Naval Reserve. The correlation between Hay No. 1 and Tupman No. 1 established the existence of a major oil structure at Elk Hills.

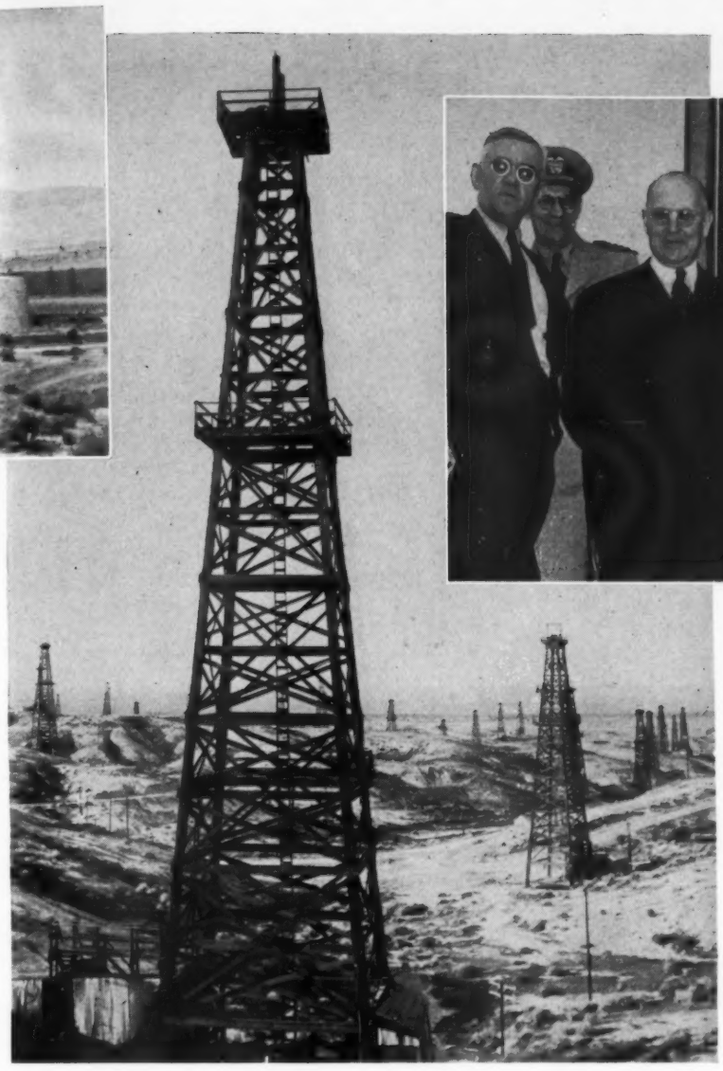
On February 24, 1908 George Otis Smith, director of the United States Geological Survey recommended establishing Naval petroleum reserves in California. In support of his plea he pointed to the action of the British government in conserving British liquid fuel for the Navy. On September 17, 1909, the Director again advocated the establishment of suitable naval reserves in California. Just ten days later all government lands in California and Wyoming were withdrawn from development for petroleum production pending the adoption of a definite policy.

It was not until September 2, 1912 that President William Howard Taft created, by executive order, Naval Petroleum Reserve No. 1 consisting of 38,069 acres of land in Elk Hills and shortly thereafter created Naval Petroleum Reserve No. 2 consisting of 29,541 acres in the nearby Buena Vista Hills. The reserve lay dormant until seven years later when Standard brought in the discovery well in the central portion of the Elk Hills reserve.

The completion of producing wells within, and on the same structure but adjacent to, the reserve emphasized the need for protecting the structure from drainage. On June 4, 1920, Congress gave the Secretary of the Navy power to lease land in the Reserve where necessary to protect it from drainage. The oil wells on Navy land in the field were largely drilled on leases granted at that time. It has been a slow and orderly development over almost a quarter of a century that enabled the operators to meet the current emergency so efficiently.

President Roosevelt enlarged the Reserve in 1942 to approximately 43,000 acres in order to include all oil bearing land in the Elk Hills structure. Approximately 85 per-cent of the land in the Reserve is the property of the United States Navy with the balance owned by Standard of California. A single half section is owned by the Kern County Land Company and is leased to Standard. This enlargement in 1942 to include all land in the structure paved the way to successful execution of the Unit Plan of operation.

By June, 1944 California's above-ground supply of oil had been almost depleted and the Joint Chiefs of Staff realized the need for developing additional productive capacity in California to insure adequate supplies of petroleum products in the Pacific theatre. They urged that production from the Elk Hills Reserve be increased to 65,000 barrels per day as rapidly as possible. The Navy immediately started to work out a suitable plan of development and through the close cooperation of the Naval Affairs Com-



Left: Tupman No. 1 Second Producing Well at Elk Hills and First Producing Well Completed Outside Naval Reserve.

Inset: V. O. Wankowski

Representatives of the Navy and Standard Oil Company are Shown During a Congressional Inspection Tour — Left to Right: A. L. Tietze; Capt. V. H. Wilhelm, USNR; R. C. Stoner; Capt. Harry Stoltz, USNR; Capt. W. G. Greenman, USN; F. S. Bryant; J. L. Hanna; Capt. Donald J. Ramsey, USN; and Jules Toussaint.

Right: Servicing Wells in Old Section of Field with Modern Portable Equipment.

mittee of Congress, were able to devise the adequate and workable Unit Plan of operation. On June 19, 1944 the Navy Department and Standard of California signed a contract under which the Unit Plan was to operate. This contract was approved by Congress and signed by President Roosevelt on June 28, 1944.

Unit Plan of Operation

Details of the Unit Plan were worked out by the Naval Affairs Committees of Congress assisted and advised by experts from the Navy. Floyd S. Bryant, director and vice president of Standard of California, appeared before the Naval Affairs Committees and his obviously wholehearted desire to produce a maximum of oil through this operating plan convinced Congress that condemnation of Standard's property was not necessary. Unit Operation-Naval Petroleum Reserve No. 1 is actually carried out under two separate contracts between the Navy and Standard of California. The first contract established the unit and erased surface rights. The second appointed Standard as the operator under which development was to proceed.

The Unit Plan contract set up the machinery for the unification and operation of Naval Petroleum Reserve No. 1 under the guidance of an operating committee of two members. Captain Harry P. Stolz, USNR, was appointed to represent the Navy and Victor O. Wankowski to represent Standard of California. The operating committee directs and supervises all exploration, prospecting, development and production operations with Secretary of the Navy Forrestal as the sole arbitrator in case of dispute between the two members.

Proration of oil produced is on the basis of acre feet of oil strata underlying each landholder's acreage. Petroleum engineers have demonstrated the uniform character of the producing sands for the entire structure; so this distribution of production is both fair and easy to calculate. All surface boundaries and rights were erased upon signing the Unit Operation contract and no adjustment is made on the basis of the individual production of any single well.

Standard's total recovery is limited to (whichever is least) 25,000,000 barrels after November 20, 1942 or one third of Standard's estimated recoverable oil from the Reserve. It is now estimated that 25,000,000 barrels will be Standard's share of production from the shallow zone wells. This plan of prorating production allows the committee to develop the entire structure in the most efficient manner. It makes possible the maximum recovery of oil and gas from the field without concern for production from any single parcel of land.

The Engineering Committee of six men was also set up under the terms of the Unit Operation Contract. This committee determines among many other things the number of acre feet of oil producing strata under each parcel of land and sets up the basis of prorating production between the Navy and Standard. Captain V. H. Wilhelm, USNR, Inspector of Naval Reserves in California, chairman of the committee and Captain Harry P. Stolz, USNR, and Lewis MacNaughton are the other Navy representatives. Messrs. Earl G. Gaylord, Victor O. Wankowski and Wendell A. Eardley are Standard's representatives.

Under the terms of Unit Operation the Navy could select any one they desired to carry on the operation and development work of the Reserves. If Standard of California was selected as operator it was stipulated that it must do the work at actual cost without any additions for overall company overhead nor any cost plus a percentage of profit. Due to Standard's knowledge of the field and adequate facilities in the vicinity it was selected to operate the unit. Standard

set up a complete operating department at Elk Hills to devote its entire time to this project. The department includes not only drilling and production personnel but also a complete petroleum engineering section, maintenance and construction division, accounting department, a warehouse and supervisory staff. Fred Tratt is superintendent of the Unit Operation and Lee Chamberlin is office manager for Standard.

The operating agreement between Navy and Standard controls the details of drilling and producing the oil and also the rate at which the oil can be removed from the Reserve. The present production is approximately 65,000 barrels per day from which Standard receives 15,000 barrels, this being its average daily production prior to the installation of unit operation. The entire balance goes direct to Navy projects through sale to various oil refiners.

Standard's withdrawals are limited under the agreement and the company will not be permitted to withdraw more than one-third of its total potential production from the shallow zones. When the oil is not required for vital Navy uses withdrawal will be reduced to a minimum. The operator will be permitted to maintain production at a level that will pay taxes on the property and also keep the wells in good operating condition. The control exercised through the Secretary of the Navy under the terms of these contracts will be effective in keeping most of the oil underground in time of peace and yet available for peak production in time of national emergency.

Development of Elk Hills under Unit Operation is a joint effort of naval and civilian personnel. Standard was entitled to furnish all the operating personnel but due to the manpower shortage had to request assistance from the Navy. In setting up the unit Standard drew upon the most capable members of its organization and the result is a very efficient working organization stationed at Elk Hills and devoting its entire time to this project. Standard Oil Company personnel assigned to the San Joaquin Division at Taft are also called upon when needed. A. L. Tietze has been most liberal in loaning specialists when needed and has devoted much of his time to Unit Operation.

Victor O. Wankowski came to Elk Hills after seventeen years of service with Standard including experience in most California fields and Alaska. Fred Tratt, field superintendent, also has a wide range of field experience and these men have welded a team that cooperates well with the Naval personnel.

Captain Harry P. Stolz, USNR, is Commanding Officer of UO-NPR No. 1 as well as Navy representative on the operating committee. Captain Stolz has 24 years combined army and navy service to his credit and is well qualified to lead the Navy personnel. In addition to this he has wide mining and oil producing experience both as a consulting geologist and petroleum engineer. Commander F. G. Taves, USNR, Executive Officer, is another capable oil man having wide experience with California oil production.

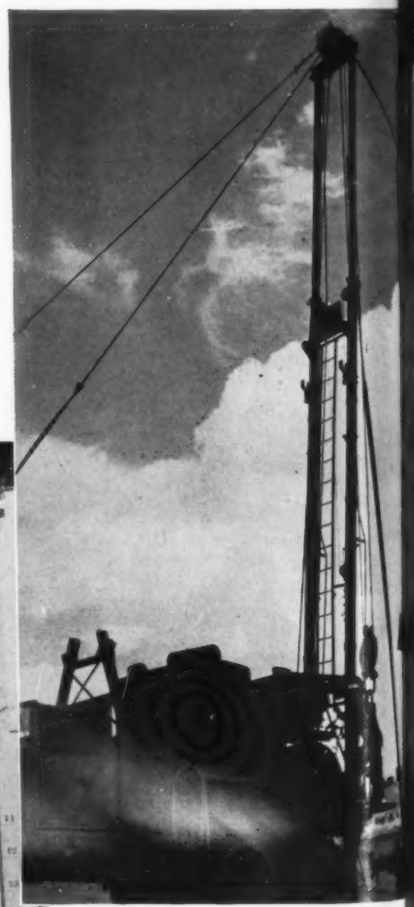
The entire Navy and Standard personnel are so well qualified that it would be hard to again assemble another group of equal ability. The Navy men were selected because of their special qualifications and ability to operate an oil field. This has resulted in close cooperation between civilian and naval personnel. Crews composed of mixed civilian and navy men are not uncommon and each man is fitted into his most suitable position. Proof of the splendid feeling at Elk Hills was shown when the new offices were opened. Over eighty individuals and organizations gave Unit Operation a grand house warming in the form of a barbeque and picnic. This was done because the men associated with the unit respected the ability of the operators, both civilian and naval.

The drilling operations have been carried on by drilling sub-contractors with twenty rigs in operation and as many as fifteen separate contractors employed. This work is done under the supervision and guidance of three Standard and four Navy drilling foremen or tool pushers.

Construction

Construction of adequate roads was the first problem in the development of the Reserve. This was solved by the Navy. A batallion of Sea Bees moved in on the job and brought several train loads of heavy earth moving and construction equipment with them. Lieut. Commander Day, USNR, was in charge of the first work and later Commanders Frye and Cline assumed command. The Sea Bees all had overseas experience and knew how to operate bulldozers, tractors, shovels, graders and other road building equipment. They did their jobs well at Elk Hills and rushed preparations for actual drilling ahead by several months.

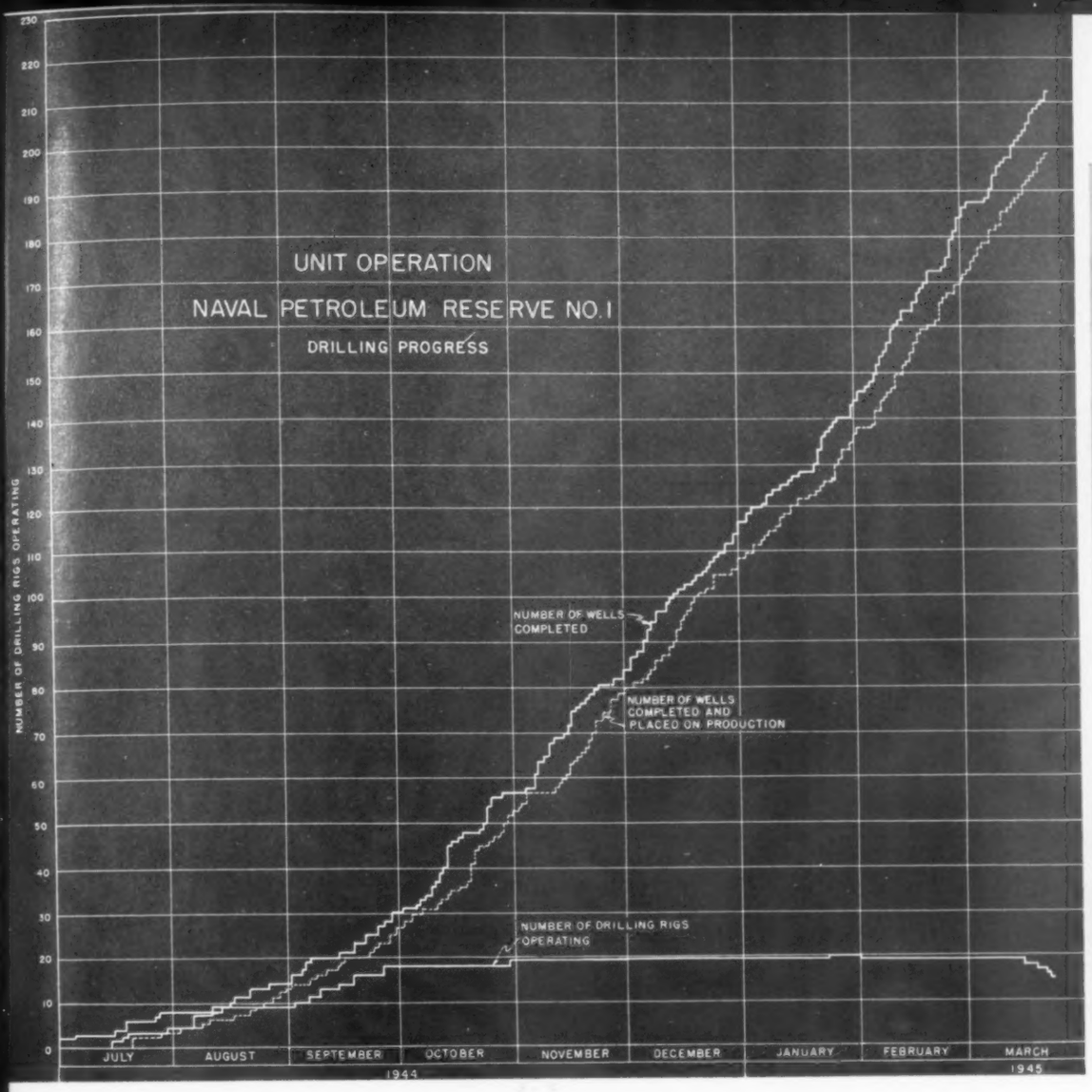
Over 50 miles of fine roads were built connecting all operations. More than 100 rig sites were graded and made ready for drilling crews and rig builders. Tank farm sites were leveled off and locations for gas traps prepared. The Sea Bees prepared Elk Hills for six months drilling in less than two months. All this work was done



Above: First Well Completed by Unit Operation Development.

Right: Quarter Section Gathering System Includes Tanks and Gas Traps.

Extreme Right: Truck Mounted Well Servicing Unit with Telescoping Mast.



Injection Well Now Used in Repressuring Elk Hills Shallow Zone.

at a time when civilian equipment was working to full capacity. The Sea Bees deserve great credit for getting Unit Operations off to a flying start.

Since the Sea Bees left civilian crews have been busy keeping ahead of drilling crews and heavy construction equipment is always at work in the Reserve. Eight parties of surveyors are required to keep ahead of the road building, drilling and production crews. These are all Navy personnel. Navy men are also busy building gathering systems, laying pipe lines and installing pumping units.

The permanent camp at Elk Hills has an interesting history. The Operating Committee wanted to build a camp that would be suitable for the climate, with extremes ranging from over 110 to below freezing, and they wanted to build it at a minimum of expense. The Japanese relocation center at Santa Anita was being demolished at the time work started on the Unit Operation and it was found that these houses were pre-fabricated and easy to move. A double row of these houses, formerly used by Japanese internees, now forms the headquarters for Unit Operation. A narrow section of roof connects the two rows and forms a long hall the length of the building. Many of the offices still bear the names of the former Japanese occupants. Adequate heating and air conditioning make them comfortable working quarters in all weather. The use of these buildings was another major saving in the construction work.

Drilling Progress

The first well of the Unit Operation was spudded in on June 29, 1944, just ten days after the contract was signed and one day after it had been approved by President Roosevelt. Fifteen days later the well was completed. This high level of efficiency and desire to get the work done and oil produced has been evidenced throughout the entire operation. By the end of July there were eight rigs drilling and this number stepped up until twenty were in operation. All these rigs had to be located and moved in without disrupting the already ambitious drilling program being carried on in California. Manpower was a big problem and one marvels at the progress that has been made with the unskilled help used on many of the jobs.

Contractors have completed almost one hundred wells in the last hundred days despite the fact that the equipment and personnel of the drilling crews is not always up to the highest standard. The drilling time is between eight and twenty days from spudding to spudding. December completion totaled 32, or one well per day with one extra well as a Christmas present. The monthly completions since the start of the operations are tabulated below.

July 1944	4
August	10
September	16
October	27
November	27
December	32
January 1945	29
February	39
March	38

The petroleum engineers have done an extraordinary piece of work in locating the drilling sites. Over 200 wells have been drilled and there have been only two dry holes.

The wells are spaced on a 10-acre pattern but the sub-surface completions are on 20-acre spacing. Each alternate well is completed to the Scalez sand and the other wells completed to the Mulinia sand. The location of these closely related sands is shown on the chart and described more fully under the geology of the region.

All drilling is done by sub-contractors under the supervision of Unit Operation drilling foremen. Standard has supplied three foremen and the Navy four making a total of seven to supervise the operation of twenty rigs. These foremen check all cement jobs and water shut offs, supervise all production tests and see that the petroleum engineers program is adhered to. They also check the installations of all blowout prevention equipment and well connections and order all material furnished under Unit Operation. Each drilling contractor has his own tool pushers to supervise drilling, moving and rigging up of equipment. All drilling contracts are on a footage drilled basis and as a result each contractor strives for greatest efficiency. The only day labor charges are while the well is being placed on production. None of the drilling is on a cost plus or day labor basis.

Drilling Equipment

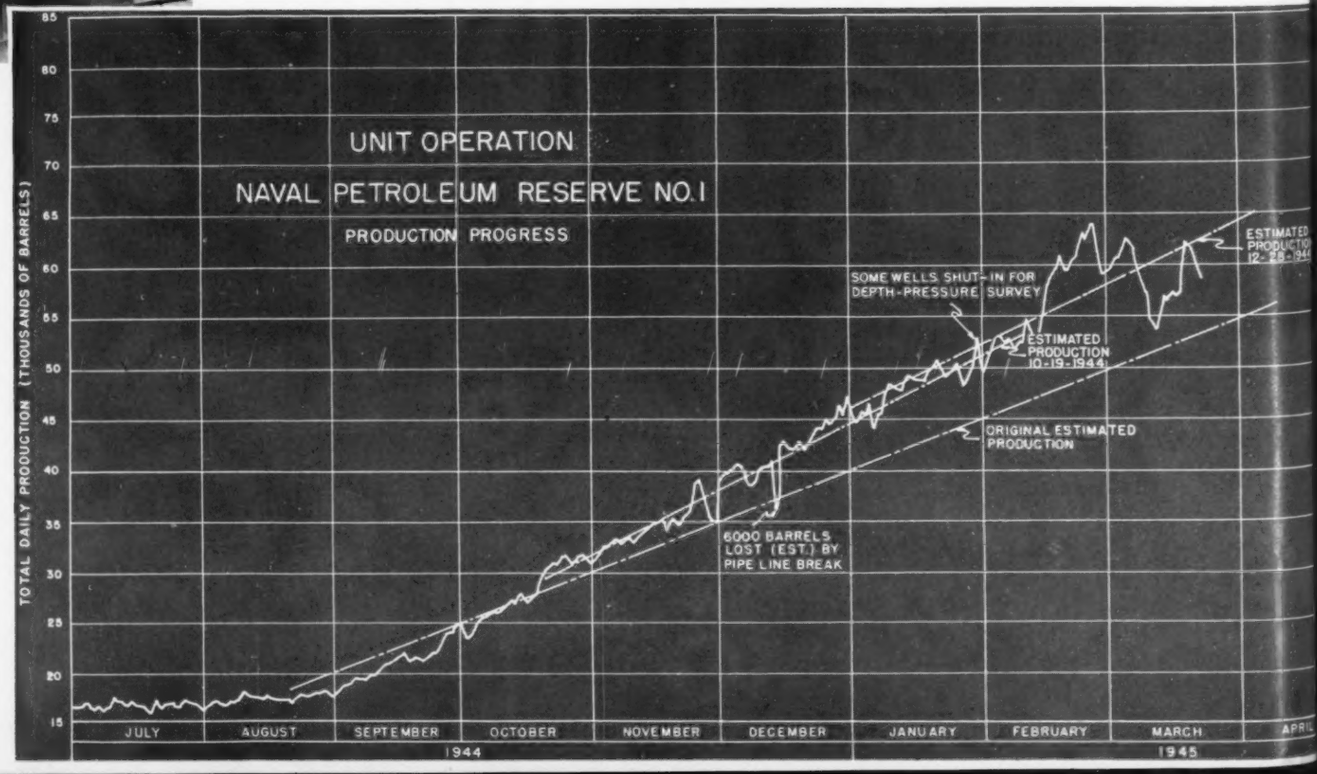
Internal combustion engines power all drilling rigs on the Unit Operation. There is not a single steam rig in operation on the Reserve. The engines vary in size from Ford Mercury engines to 8-cylinder diesel engines with 1662 cubic inch displacement and 6-cylinder natural gas-butane engines with 1650 cubic inch displacement. Most slush pumps are powered by engines separated from the drawworks unit and it is common to find considerable more horsepower on the pumps than on the hoisting equipment. Many of the drawworks are of modern construction incorporating friction clutches, oil bath chain lubrication, water cooled brake rims and automatic catheads.

Drilling is done under a variety of towers. Numerous 122 foot standard galvanized steel derricks are in the service. All contractors using this type of tower have the rig builders erect a tower ahead so there will be no delay in moving. Heavy duty "jack-knife" derricks are also used in a number of cases and they prove adequate on these wells. The fine roads allow moving the jack-knife derricks in relatively large sections. Other contractors are drilling under all welded pipe masts of sturdy construction fabricated in a Bakersfield shop. These are open face masts that lay down at right angles to the axis of the drilling rig and move in a very few pieces. One operator is using a two-legged pipe gin pole that is mounted on a semi-trailer with his drawworks unit. This unit is the most portable in the field.

The heaviest drilling units on the Reserve are diesel powered units owned by the Navy. This equipment was purchased by the Army for a program now postponed and the Navy was able to obtain many critical pieces of equipment from that source by transfer. The drawworks is powered by two large diesel engines compounded by multiple strand chain in an oil bath guard. The drawworks is on the most modern design with friction drum clutches, fully enclosed chain drives, machine cut sprockets and high leverage brakes

Left: Heavy Duty Jack Knife Derricks Used on Several Rigs.

Right: Light Portable Well Servicing Machine with Gin Pole.



Two 7-1/4 x 12 slush pumps provide ample mud and each pump is powered by its own independent diesel engine. The drive to the pumps is through multiple strand chain. A mud reconditioning system is completely unitized and includes an all steel mud tank, sand shakers and screens, chemical treatment unit and manifolds.

The crown block is built into the 122 foot jackknife derrick with an offset sheave to provide clearance for the hoisting line outside the derrick. Swivel, links, connector and traveling block were all selected for long life and short overall length. The connector is direct connected to the traveling block to save space and the swivel is suspended from the links in a special adapter to save time when adding singles of pipe. Special equipment includes adequate gauges and weight indicators, cathead guards, automatic cathead and short coupled tongs.

An efficient light weight unit had drilled to a depth of 2000 feet in 48 hours under a standard derrick. It is interesting from several points. The drawworks is powered by a 145 horsepower natural gas engine and the 7-1/4 x 14 slush pump is powered by a 225 horsepower natural gas engine. This large pump capacity and power adds greatly to the speed with which these wells can be drilled.

The mud system on this rig is of the simplest possible construction. It consists of a wooden ditch with shaker and a slush pit consisting of a hole dug in the ground. The pump does not have flooded suction.

The drawworks and rotary power is transmitted through a hydraulic torque converter which is given credit for decreased hoisting time and decreased maintenance cost and shutdown time. This hydraulic torque converter reduces the shock loads on the drawworks, chain and drill pipe and its flexibility and torque characteristics materially reduces hoisting time.

The derrick is a 122 foot by 24-foot standard steel derrick and the blocks and swivel are conventional. This operator claims to move as fast or faster than other types of rigs when he has a derrick erected ahead of each well.

Many other interesting drilling rigs are in operation each with its fine points, each different, and each doing a good job and completing successful wells in an average of 20 days. The speed with which these wells are drilled and the rate of completion is best known by the chart of drilling progress. Unit Operation is proud of its record of completing almost a well a day and only two dry wells.

Production Progress

Production of crude oil from Naval Petroleum Reserve No. 1 has approached 65,000 barrels per day, the amount set by Congress and the Joint Chiefs of Staff at the inception of the program. Production is three months ahead of schedule and this record tells more than any other statement of production progress. Before the start of Unit Operation Naval Petroleum Reserve No. 1 the field was producing an average of 15,000 barrels per day. Since June, 1944, almost 6,000,000 barrels of petroleum has gone directly to naval and military uses as a result of this increased production.

Despite the demand for an ever increasing production the Reserve oil is withdrawn in an orderly manner with constant consideration for maintaining the field as a reserve capable of producing for future emergencies. As all limits of ownership were erased upon the signing of the Unit Operation contract there is no fear of offset wells draining the strata. This makes it possible to develop the field in the most economical known manner with a maximum consideration for long life and greatest ultimate recovery.

Murray Putnam, and the other petroleum engineers, are making a complete study of the reservoir character and are checking their work as new wells are completed. The drilling engineers supervise taking cores when required and careful core analysis reveals the porosity, permeability and fluid saturation of the sands. Electrical logs, directional surveys and hole temperatures are also regularly recorded and the results tabulated and analyzed. The production engineers make regular checks of bottom hole pressure, gas oil ratio, water cut and encroachment of edge water. From a study of individual well records and reservoir fluctations they control production to preserve good drainage. Repressuring has been started and other means of secondary recovery are being studied.

Production Equipment

All of the shallow Scalez and Mulinia zone wells are on the pump. Eight wells have been drilled to the Stevens zone. Many types of conventional pumping units, all powered by natural gas burning internal combustion engines are working in the field. One of the interesting units is a timber pumping unit. This was built for the Army's use abroad during the most critical shortage of steel. This unit was designed for fabrication of all the timber sections abroad and the concrete counterbalances would have been cast in the foreign field. Conventional pumping is done through polish rod, sucker rods and plunger type pumps.

Oil from the shallow zone is produced from the tubing and gas is drawn from the anular space between the tubing and casing. Both oil and gas are delivered to gathering tanks and gas traps located at quarter section intervals. As the oil is produced without regard to individual well production, except for production tests, it is not necessary to gauge each well's production. For this reason comparatively few gathering tanks are required at each station. The oil is pumped, or allowed to flow, from these gathering tanks to the main tank farm for shipment. The gas traps separate the natural gas and gasoline and from there it is delivered to the natural gasoline plant for treatment.

The gathering tanks, gas traps and pipe lines are largely constructed and maintained by Navy men. Heavy six by six trucks and command cars are popular methods of transportation for material and men.

Well servicing is also carried on by Navy men with equipment obtained from the Army's abandoned program. All the servicing units are powered by diesel engines as they were intended for use in a field far from a supply of natural gas. The units are of two general types. One group is a simple truck mounted servicing unit with double drum but without a mast. This type works on the old wells in the Reserve many of which are still pumping through old standard ends and under wooden derricks. The derrick is used in pulling the well but the band wheel and bull wheel are not used in any operations.

The new wells are all pumping without derricks and the servicing units working on these new wells are equipped with truck mounted telescoping tubular pulling masts. Both single and double leg pipe masts are used. These units are mobile and are set up quickly at each location.

Gasoline Plant and Gas Injection System

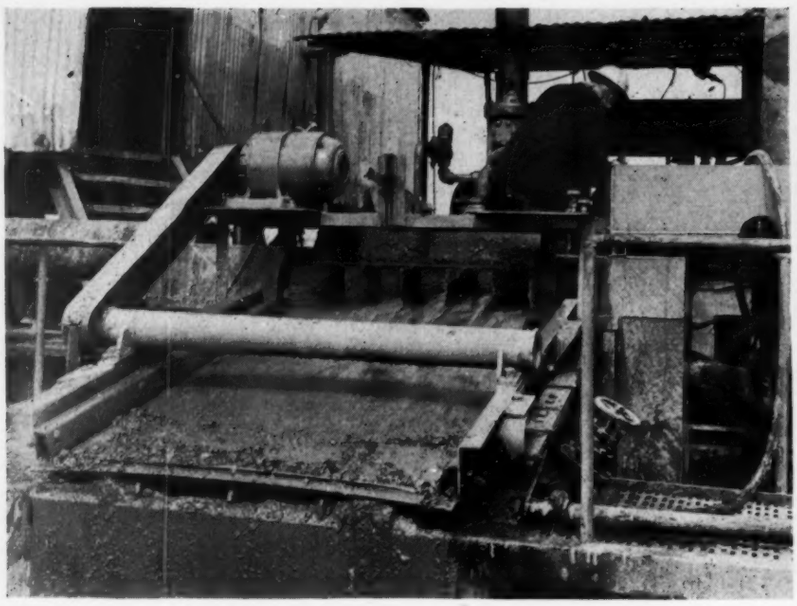
Unit Operation has taken over the existing natural gasoline and gas plant at Elk Hills and is now busy enlarging its capacity. Five new 300 horsepower compressors are included in the new addition. This plant takes the wet gas produced in the casing and removes the natural gasoline contained. The dry gas is then delivered to the pipe lines of the public utility purchasing this product. Approximately 4000 gallons of natural gasoline are recovered per day at this plant.

Some of the natural gas produced is used to repressure the reservoir. The repressuring program is claimed by some to be the most far sighted action of the Operating Committee. A portion of these injection projects will be of the nature of pressure maintenance, others will be of the gas drive type. These plans should prolong the life of the Elk Hills Reserve as a producing field and increase the ultimate production.

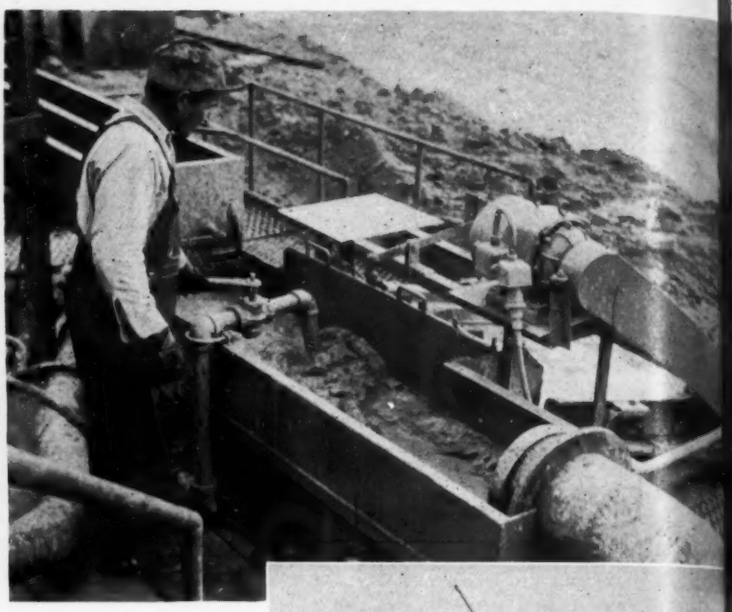
Naval Fuel Annex

The U. S. Naval Fuel Annex located near Elk Hills is separate from the Unit Operation. All the Navy's share of oil, natural gas and natural gasoline is handled by the Fuel Annex as a part of the activity of the Eleventh Naval District.

The Fuel Annex is responsible for the receipt,



Large Capacity Sand Shakers Remove Cuttings from Drilling Fluid.



Unitized Mud Conditioning Unit Simplifies Mud Control.

225-Horsepower on Slush Pump Assures Ample Drilling Fluid.

custody and issue of all petroleum and petroleum products produced for the Navy's account from the Unit Operation. From September 1944 to December 31, 1944 the Fuel Annex received from the Unit Operation 2,036,299 barrels of crude produced from the shallow zones, 97,456 gallons of natural gasoline, 75,025,000 cubic feet of natural gas. The oil was delivered to the Union Oil Company, Shell Oil Company, Incorporated, General Petroleum Corporation, The Texas Company and the Mohawk Oil Corporation. The natural gasoline was delivered to the Mohawk Oil Corp. and the natural gas to the Southern California Gas Company. 72,560 barrels of crude produced from the Stevens zone was also delivered to Mohawk.

It is estimated that the Fuel Annex will handle approximately 6,733,000 barrels of shallow zone crude in 1945. All this oil goes directly into military products. None is diverted to civilian uses.

The physical equipment of the Fuel Annex includes 17 storage tanks of 37,500 barrels capacity each or a total of 637,000 barrels.

Purchasers of fuel from the Annex have set up their own pumping stations adjacent to the tank farm and they send the crude on its way to the refineries in the Los Angeles basin. One pumping station consists of five steam boilers with standard steam shipping pumps to handle the crude. Another major station is powered by large internal combustion engine driven shipping pumps. This closely integrated shipping and storage system simplifies the disposal of the Navy's portion of crude produced.

Geology

Intimate information regarding the structure and shallow oil bearing zones of the eastern portion of Elk Hills has been accumulated over a quarter of a century of moderate drilling by private enterprise. This knowledge has insured maximum production in the emergency with a minimum expenditure of material and manpower.

Such data is not available for the western section of the Reserve and it would be very worth while information to assemble before the need for exploiting that section becomes critical.

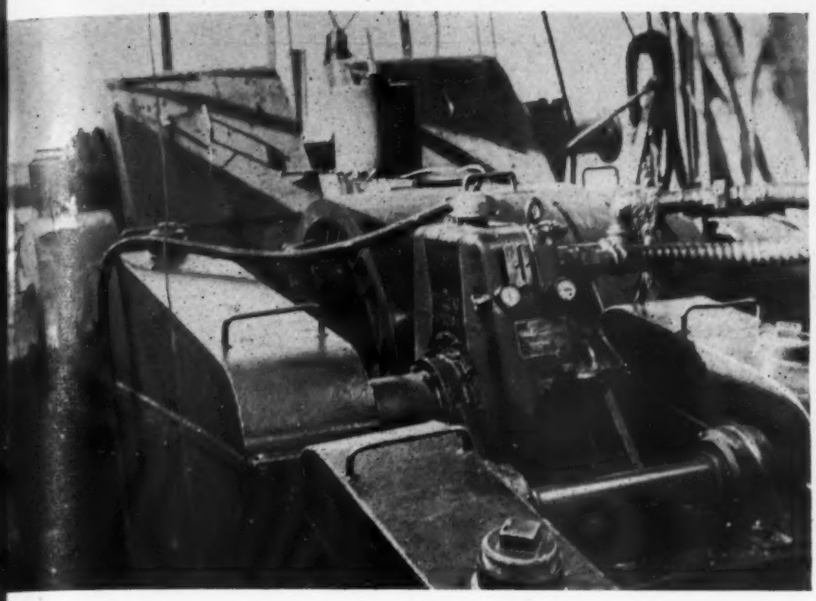
Most of the exposed structure of Elk Hills is non-marine deposits of the Pleistocene or late Pliocene age. The low hills are almost barren semi-desert with deep arroyos cut by the occasional desert cloudbursts. The exposed formations are largely sands, clay, marl and unconsolidated gravels.

The oil bearing structure is an anticline about six miles wide and seventeen miles long. Developments indicate three closed domes in the Reserve, one, the well developed eastern area; another, Hay-Carmen area where the discovery well was drilled; and a third, in the Hillcrest area of the extreme western section of the Reserve. In general the sub-surface contours follow the major outline of the surface structure. Several faults cut the structure up into smaller blocks and little oil can be produced from the fault zone. Most of the faults have been located from well records as there are but poor surface indications of them.

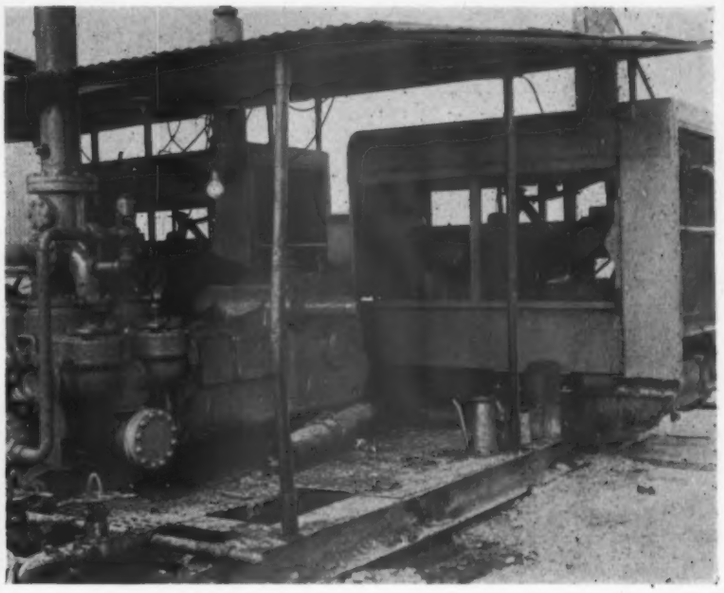
The bulk of the present production is obtained from rocks of the Pliocene age at a depth of between 2300 and 3400 feet. This shallow producing zone, with a thickness of about 300 feet, is at the base of the San Joaquin Clay and overlies the Etcheogin formation. Two excellent fossil markers locate the producing zones and the shallow producing sands derive their names from these markers. The uppermost zone, called the Scalez, is located from a fossil bed about three feet in thickness immediately overlying the oil zone. This bed is full of Scalez fossils which are thought to be the door of a snail's shell. The next zone, called the Mulinia, is marked by large thick clam like shell fossils. The Scalez is the most important producing sand in the eastern portion of the reserve and is likely to cover the greatest area in the structure. Although the Mulinia sand was not produced from in the old wells drilled in the eastern section it appears to be a good producer toward the central Hay-Carmen area.

Underlying the shallow low pressure zones is the Stevens zone which is the source of the prolific Coles Levee field. This zone has been penetrated by a few exploratory wells which are now producing from between 5000 and 7000 feet. The extent and nature of the structure of the Stevens zone is not yet established. This may well prove to be the most prolific zone in the Reserve capable of producing high gravity oil.

A high pressure gas zone has also been developed



Hydraulic Torque Converter Adds Ease of Operation to Compact Rig.



Slush Pumps with Powerful Independent Engines.

and it overlies all the producing oil zones. This gas comes from the San Joaquin Clay formation at a depth of between 1000 and 2000 feet. Pressures as high as 1500 pounds per square inch have been recorded for this zone. This is one of the large potential undeveloped dry gas fields of California.

Undeveloped Section

Although the eastern section of the Reserve has been intensely developed and is as well logged as any field in the state there are large areas of the western section that remain undeveloped. It is now the hopes of the Operating Committee to obtain permission to drill exploratory wells in the undeveloped western section of the field. It was in the Hay-Carmen area that the discovery well was drilled. This falls in the central section of the Reserve and development is rapidly approaching the discovery section proving the structure over approximately one half of its length. The western or Hillcrest section is undeveloped and it gives promise of adding considerable producing area to the Reserve. Thirty-seven well sites have been chosen, spaced about one to a section, in this Hillcrest area. If carefully drilled and cored they would prove much about the production possibility of this large undeveloped area.

The underlying Stevens Sand is another large unknown at Elk Hills. Some of the finest oil fields in California are producing from this deep sand and current production at Elk Hills proves its presence at depth. The extent and potential capacity of this zone can only be determined by further drilling.

It is hoped that suitable approval will be granted for the development and exploration of the undeveloped section and the deep zone. In order to again obtain maximum added production from this Reserve in time of an emergency it is vital that this development work be done in advance. Equipment and men are now on the location and they could adequately undertake a project of this nature. The present supervisory and technical staff is of the highest type and it would be difficult to assemble such a staff of capable experts again and even they would not have the intimate knowledge of the Reserve possessed by the men now on the job. Their record of efficient production speaks for itself.

Reserve Estimate

Any estimate of the reserve of petroleum at Elk Hills must be based on the known extent of the oil bearing structure and such studies have been made. In 1932 Woodring, Roundy and Farnsworth showed that past production from the eastern section of the Reserve varied from 34,000 to 140,000 barrels per acre. On the basis of the then proven 18,690 acres they estimated the production from the proven section of the shallow zone to be in excess of 41,000,000 barrels. Their estimate of the entire probable oil bearing area was in excess of 400,000,000 barrels.

Captain V. H. Wilhelm, USNR, Inspector of Naval Reserves in California, gave the recent visiting House Naval Affairs Committee a 1945 estimate of the reserve. The Engineering Committee in preparing the new estimate calculated on 45,000,000 barrels total production from the old area which corresponds very closely with the estimate of Woodring, Roundy and Farnsworth. The new developments have, since 1932, proven approximately 375,000 acre feet of productive oil sand in the Scalez and Mulinia sands. Core analysis show the productive sands in these zones are sufficiently uniform to calculate the potential reserve on the basis of a recovery of 650 barrels per acre foot of oil sand. This would add 238,000,000 barrels to the probable reserve at Elk Hills in the shallow sands alone.

Thus the best current estimate of potential reserve in the shallow zones is 238,000,000 barrels of oil. Adding past production of over 175,000,000 barrels of oil we again arrive at a total estimated production for the shallow zones of approximately 400,000,000 which again agrees with the 1932 estimate.

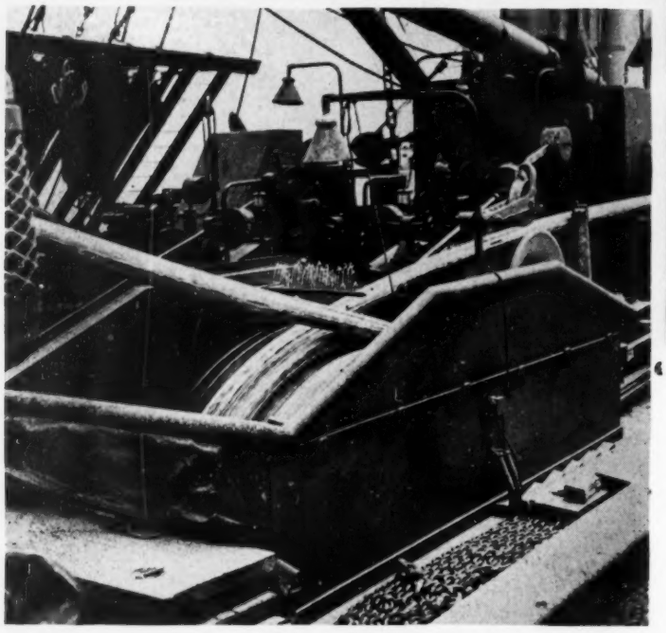
The Navy is fortunate that the long range plans of Dr. George Otis Smith resulted in establishing the Naval Petroleum Reserves. It is also fortunate that free enterprise developed the Reserve over a quarter of a century to a point where it was ready for extensive expansion when the need for Navy fuel became critical in 1944.

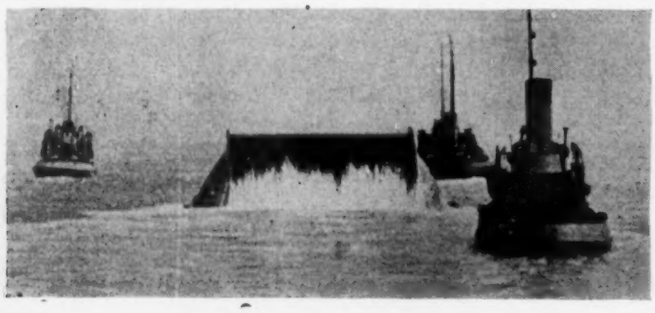
To the Navy and Standard of California goes full credit for a splendid efficient job of setting up the Unit Operation and then carrying the project along so rapidly. The close cooperation between civilian and naval personnel is American teamwork to which we can point with pride.

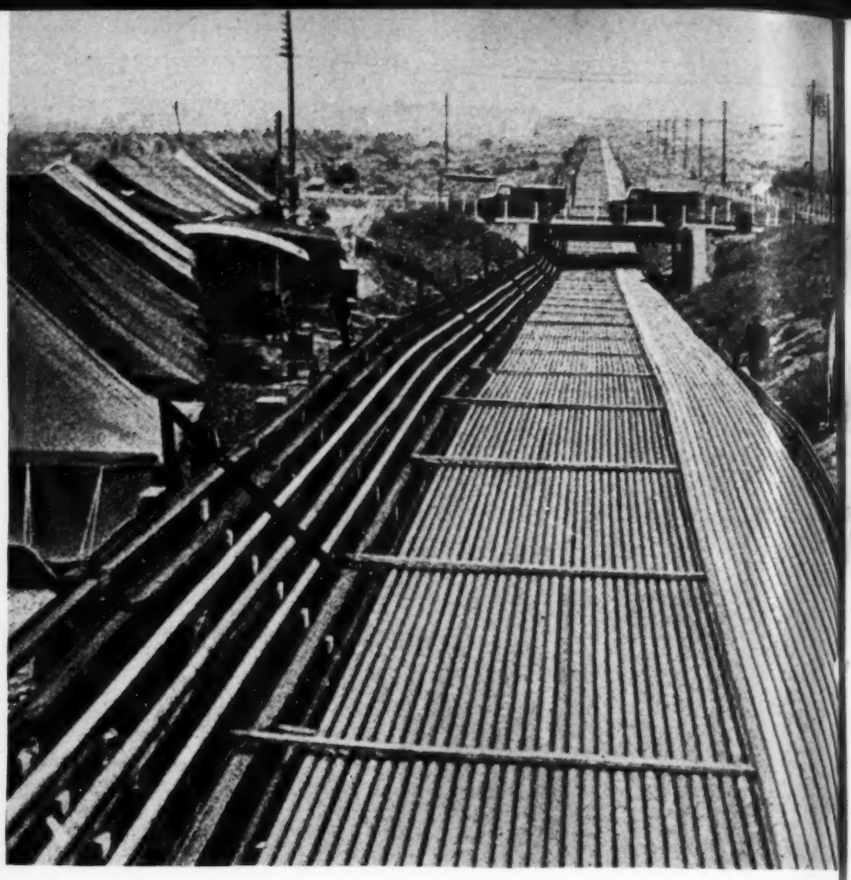
Production is being carried on in an orderly manner with repressuring and studies on secondary recovery. Exploratory drilling is proving new areas so the Reserve will be ready should future emergencies demand.

Acknowledgments

The author is inbebted to the operating personnel at Elk Hills for much of the information contained in this article. He is especially grateful to Commander Taves for his many interesting sidelights on developments. Engineering data on well completions and production was graciously supplied by Standard Oil Company of California. Data on early history and production was obtained from the California Division of Mines Bulletin No. 118 "Geologic Formations and Economic Development of Oil and Gas Fields of California".







OPERATION PLUTO

The Cross Channel Pipe Line

Left—Top to Bottom:

Pipe Line Officially Opened by Gen. Sir Thomas Riddell-Webster, QMG to Forces.

3-inch HAIS Cable Fed Over Drum During Laying Operations.

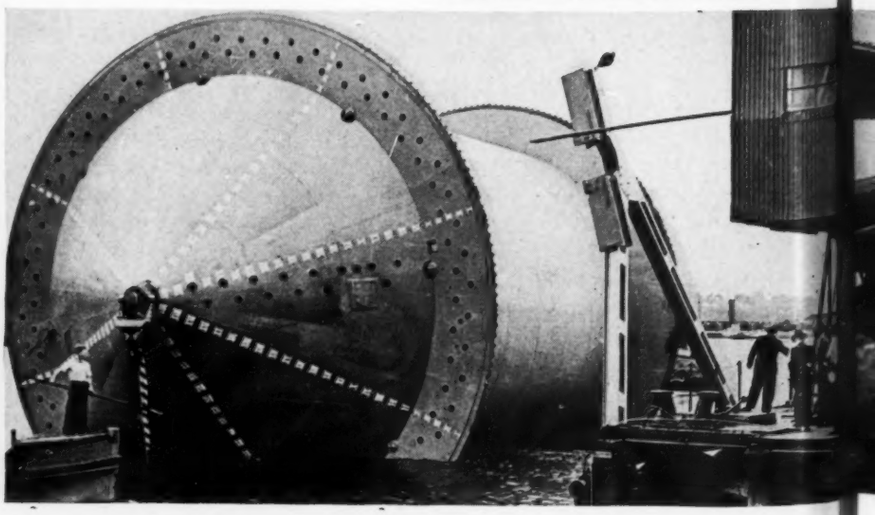
Continuous Length of HAIS Cable Carried in the Ship's Hold.

One of the Conundrums Being Towed by the Royal Navy Across the Channel.

Top Right: Hamel Pipe Stored in Three-quarter Mile Lengths Ready for Winding on the Conundrums.

Right: British Troops Installing T-union Valve at Boulogne.

Bottom: Conundrum Being Moved Into Position for Loading Steel Pipe.



ONE of many ingenious methods employed for speeding petroleum supplies to the Allied armies in Europe was the laying of a group of pipe lines underneath the English Channel. The existence of this pipe line system remained a military secret until after V-E day when it was revealed by authorization of the British government. Through these pipes, however, between August 12, 1944 and May 8, 1945, some 120,000,000 gallons of gasoline reached the British and American troops on the Continent and through the surface lines that closely followed the advance of the armies gasoline at the end of hostilities was flowing in an uninterrupted stream from the English coast to Frankfurt-on-Main.

First suggestion of a sub-Channel pipe line is said to have been made by Lord Louis Mountbatten in 1942 but it remained for A. C. Hartley, chief engineer of the Anglo-Iranian Oil Company, to convert it into practical application. His suggestion was a line built something like a submarine electric power cable without cores or insulation which could be paid out from a cable laying ship. Technicians of Siemens and Henleys constructed sections of the pipe for experimental tests which proved so successful that official approval was given to the fabrication of a quantity sufficient for a number of lines spanning the Channel. The first pipe was of 2-inch diameter but this was later increased to three inches and the pipe was strengthened to withstand pressures in excess of 1200 pounds per square inch. The product was designated as HAIS, the initials standing for Hartley-Anglo-Iranian-Siemens.

While this British plan was being developed the American army had been working on a plan for a submarine line, but after consultation it was decided to concentrate on the more advanced British project. Col. A. K. Easton of the U. S. Engineers arranged with the Phelps Dodge Copper Products Corporation, the General Cable Company, General Electric Company and Okonite Callender Cable Company for the manufacture of 140 miles of HAIS cable. With this exception the entire enterprise was British in design and execution.

In the meantime another type of pipe line to serve the same purpose was invented by B. J. Ellis, chief oilfields engineer of the Burmah Oil Company, and H. A. Hamick, chief engineer of Iraq Petroleum Company. This form, to which the name HAMEL was given, consisted of 20-inch lengths of three-inch diameter steel pipe which could be welded automatically into any length and could be wound onto a drum like thread on a spool, if the drum were 30 or more feet in diameter. To use this, the Admiralty converted a hopper barge to a pipe-laying craft with a great wheel rotating in trunnions on her deck and capable of carrying many miles of the three-inch Hamel pipe and paying it into the sea. From this a second idea was developed —a floating drum capable of carrying the full length of pipe which might be required for the Channel crossing, and which could be towed by tugs like a large bobbin paying off the pipe as it went.

Within a few months a special factory at Tilbury was equipped for welding 20-foot lengths of the Hamel pipe into 4,000-foot lengths at a rate of 10 miles daily, with facilities for storing the lengths to a toal of 350 miles a day. Shortly afterward a duplicate factory was established in case the first one should be bombed.

The floating drums called H. M. S. Conundrums (or "Conuns" for short) were moored in deep water at the end of the pipe-racks, so that the 4,000-foot lengths might be welded into a continuous length of 30 or more miles, and wound onto the conuns while they rotated. A conun is 90 feet long, over 50 feet in diameter overall, and when fully wound weighs 1,600 tons—the weight of a destroyer. It can carry 70 miles of pipeline. The drum around which the pipe is wound is 40 feet in diameter and 60 feet long.

After the successful trials of the HAIS cable in April, 1943, Geoffrey Lloyd, Minister of Petroleum in the Churchill Cabinet, arranged that the manufacture of HAIS cable and Hamel pipe, and the coordination of the whole scheme, together with provision of pumping stations on the English shore, should be the responsibility of Britain's Petroleum Warfare Department. The work then developed in conjunction with the Admiralty Department of Miscellaneous Weapons Development, while the Royal Navy accepted the responsibility of laying the pipes at sea. Thus, Force Pluto, meaning pipeline under the ocean, was formed under Captain J. F. Hutchings of the Royal Navy, composed of ships of all sizes from 10,000 tonners down to barges and motorboats manned by British merchant navy seamen. The force was placed under the command of Admiral Sir Bertram Ramsey, Allied Naval Commander.

Force Pluto's main base was Southampton, England with a secondary base at Tilbury. The force numbered 100 British merchant navy officers and 1,000 men. In addition to H. M. S. Holdfast, three merchantmen were fitted with the cable-laying machinery. Two could carry 100 miles and one, 30 miles of HAIS cable. Thames barges were converted for handling the cable at the shore ends, where large ships could not operate. Six conuns handled the Hamel pipe. New pipelines were run from the British system to take the gasoline to the coast, and special high pressure pumping stations were cleverly camouflaged. One of these was in a row of blitzed houses at Sandown, on the Isle of Wight; another was in an old fort built in the 1860's against possible invasion by Napoleon III; and others were in a modern amusement park and in seaside villas at Dungeness.

"Operation Pluto" began as soon as the mines had been swept to the approaches to the tip of Cherbourg peninsula. The four lines running from the Isle of Wight to Cherbourg took 10 hours to lay and conveyed gasoline to the United States armies. The sixteen lines established as soon as Boulogne was captured, from Dungeness to Boulogne, took five hours to lay and transported gasoline to the British 21st Army Group. Men of the Royal Army Service Corps pumped oil to cleverly concealed pumping stations on the French coast, frequently in rough weather, having to wade up to their necks to bring in the end of the line from the ships. An R. A. S. C. petroleum unit also maintained direct contact with the Trench terminals by cross-Channel wireless-telephone, thereby instantly detecting and reporting variations in the quantities delivered. A million gallons of gasoline are still being delivered daily through the system to meet the needs of the forces remaining on the Continent.

Bridge Constructed Over a Canal on Continent to Carry Pipe.

Camouflaged Storage Tank Supplying Pipe Line.

Pipe Line Running Through Woods Toward Front.

RUSSIA EXPANDING GAS PRODUCTION FOR INDUSTRIAL USES

By Raymond A. Davies

Pushing Pipeline Construction to Meet Fuel Needs of Moscow, Kiev and Other Manufacturing Centers — Program of Exploitation Planned for Rich Deposits Found to Exist in Many Parts of the Country.

Moscow (By Cable)

AFTER four years of concentration on war the thoughts and energies of Russians are turned to the repair of the damage that has been done and to the great industrial expansion that they plan for the future. Not that they have waited for the final downfall of Nazi power to begin the work of restoration. That was started in every invaded district as soon as the enemy was driven out. Now, however, it is possible to undertake projects for which neither men nor materials were available before.

One such enterprise from which great results are expected is the building of a pipeline 490 miles long to bring natural gas from Saratov to Moscow to provide heat and power that are urgently needed. The fuel problem is a serious one not only for the capital but for all the industrial sections of central and southern Russia and the Ukraine. The coal that is available from nearby sources is of low calorific value and that of better quality in the Donetz basin is far away and is needed by industries located in that region. Wood is not plentiful in this part of Russia and aside from its inefficiency as a heating medium it requires much labor for its preparation. Russia is short of transportation facilities and the movement of solid fuels makes heavy demands on transportation. Under these circumstances natural gas is the logical answer and fortunately abundant stores of this superior fuel have been found within a reasonable distance during the course of the war.

Natural gas is no new discovery in Russia. It has been produced for generations in Baku and at other points in the Caucasus but in Central Russia it has received attention only in recent years. In August 1942 when the enemy neared Stalingrad fuel became scarce in Saratov which was in the immediate rear and it was determined to lay a pipe line from Yelshanka to bring in natural gas. The line was started on September 5 and was completed on November 1. The whole population shared in the work; old pipes were dug up and relaid and pumping machinery was fabricated from old metal. The situation was saved and within a few months the war production of Saratov was tripled.

The gas supply at Yelshanka was limited and drilling was begun at nearby Kurdyum where deposits estimated at one hundred billion cubic meters were located. By shifting to gas Saratov saved more than 500,000 tons of coal between October 1942 and December 1944. To move this quantity of coal five hundred railway trains of Russian size would have been needed. It is calculated that the employment of gas avoids the use of 1200 tons of solid fuel per day in the Saratov district.

Last fall the long-suffering residents of Moscow who had been compelled to go without fuel in their homes in order to produce tanks and planes for use against the enemy were cheered by an announcement that the government had decided to build a gas line from Saratov to their city and that it was to be put into operation by December 1945. The line will give Moscow 1350 thousand cubic meters of gas daily which is five times the amount produced by the Moscow gas works. Not only will it improve the quality and quantity of fuel available for use but it will free for other and more important work thousands of men and women who would be required to produce coal or wood and will release hundreds of railway cars from use in hauling solid fuel. Both these savings are important under existing conditions in Russia.

Up to the beginning of this year nineteen wells had been drilled in the gas field. Thirty-five more are being put down some of which will reach a depth of 3500 feet. The gas will be gathered into collectors and pumped to Moscow under a pressure of fifty atmospheres by six compressor stations. In Moscow two distributor stations are being built and it is planned to construct high pressure rings encircling the city and to lay more than fifty miles of mains to deliver gas to consumers. Factories are building new types of kitchen ranges and burners for boilers since methane will require different equipment than relatively "cool" gas used at present.

The pipe line follows practically a straight line and is laid in a trench five feet deep. Cereal grasses are planted above it so that any leaks will be revealed by a change in color of the vegetation. A telephone line parallels the pipe system and the right of way will eventually carry an improved highway leading direct from Moscow to the Volga. Some 30,000 workers will be employed in building the line at the peak of construction during the summer months. Latest improvements in pipe line building will be utilized and electric current will be employed to prevent corrosion.

In the Ukraine a similar pipe line 450 miles long will be built to convey gas from the Dashawa fields in the sub-Carpathians to Kiev. This line is scheduled for completion in November next and in addition to serving industrial plants in Kiev, it will supply fuel to Vinnitsa and Proskurov as well as to sugar factories, flour mills and collective farms in the area. Other lines are projected for future construction to other Ukranian cities, possibly including Kharkov.

Recent geological explorations have established that rich gas deposits exist in many parts of Russia including the Pechora River Basin, the western Urals, the middle and lower Volga districts, the Kalmyk steppes, the northern Caucasus, Daghestan, Kuban and the Crimea. It is the intention of the Russian authorities to bring these valuable resources into use as rapidly as possible to aid in speeding up industrial progress which unavoidablly has been held back during the years of war. About the time of the building of the Yelshanka-Saratov line another line was laid from Buguruslan to Kuibyshev, a distance of 125 miles. It began delivering gas in September 1943 and today more than 140 plants in Kuibyshev and Chkalov provinces are being served by it. Construction of a second line leading to Kuibyshev is now beginning. Gas is used as fuel in many steel mills and experiments are being made in an aviation plant with its use under compression in testing airplane engines. In Kuibyshev and Saratov methane from high pressure tanks is being used in refueling trucks and other motor vehicles. In Central Asia a line is being built connecting Andijan with nearby fields.

The gas fields supplying Saratov have been proved to have multiple producing horizons and the lowest of these thus far reached at 2600 feet is richer than the ones above. Four wells drilled to this lower horizon yielded up to 2,000,000 cubic yards of gas each in twenty-four hour periods under pressures up to eighty atmospheres.

Some oil is being obtained from certain of these wells indicating the possible development of commercial production from future drilling in the Saratov area. The flow of salt water has led to the establishment of a small by-product industry in the recovery of salt in the neighborhood of well No. 7. Each cubic meter of water yields 154 pounds of salt which is being processed for local use. The gas industry is attracting many factories to the region including cracking plants, glass works and others that depends upon a plentiful supply of cheap fuel for their operation.

While the satisfaction of direct fuel needs is the immediate objective of the current development the abundance of the deposits points to future possibilities in their use as raw materials for other products. These possibilities are not being overlooked.

Footnote:
Special to World Petroleum via Universal Trade Press Syndicate

★ ★ ECHOES FROM THE WASHINGTON OIL FRONT ★ ★

By W. J. Maddox, *Chief of World Petroleum's Washington Bureau*

Oil Study in Germany

Ed Pauley

ED PAULEY, newly appointed American member of the Allied Reparations Commission, has about completed the selection of the key members of his staff to study Germany's oil developments and to determine how they can contribute to post-war settlements. Among the chief subjects of inquiry will be the big German synthetic fuel projects. Although most if not all of them underwent severe bombings and may not be in shape to yield much information as to their physical operation, the commission is expected to be able to obtain valuable data on the processes and costs.

Latest member of Pauley's staff to be named is Lieut. Colonel E. E. Fogelson, independent oil producer of Dallas, Texas. He is now in Europe, where he has been serving as chief of the plans section of SHAEF's petroleum section. As chief counsel of the commission, Pauley will have J. Howard Marshall, president of the Ashland Oil and Refining Company of Ashland, Kentucky, and as industrial advisor, Major Jubel R. Parten of the Premier Refining Company of Houston, Texas, former Director of Transportation—PAW.

Elections Defer Oil Treaty

ELECTIONS—this time British elections—are holding up action on the Anglo-American oil pact. British negotiators are marking time till the selection of a new Parliament takes place early in July. Soon thereafter some important word on the progress of the negotiations may be expected. The American delegates, it is understood, have about completed their work on the new revised draft of the treaty. The British, however, don't want to move further in the negotiations till after the election.

Charles Rayner, petroleum advisor to the Secretary of State and a leading figure in the pact discussions, is optimistic over the progress that has been made in redrafting the treaty to overcome industry objections. Senator Tom Connally's Foreign Relations Committee, to which the pact will be submitted when in final form, is being kept advised of the progress made. Conclusion of the treaty will not be held up for the completion of the work of the special Senate oil investigating committee, which is expected to run on for many months.

Oil Products Redistribution

DURING the past six months, Brig. Gen. Howard Peckham, chief of Army's Fuels and Lubricants, has redistributed more than $1,500,000 worth of government-held excess petroleum products for use by government agencies. These products otherwise would have been placed on the civilian market through Defense Supplies Corporation.

The Office of the Quartermaster General, of which Fuels and Lubricants is a division, was set up last August as the overall Army disposal agency for all petroleum products except aviation gasoline. All commands and technical services in the Army in the continental United States report to it all stocks on hand in excess of normal operating needs.

Robbins Succeeds Parsons

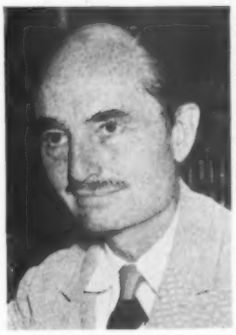
APPOINTMENT of E. E. Robbins of Tulsa as Director of PAW's Materials Division, in place of Claude P. Parsons who resigned June 5, brings back to the organization a man who twice since joining the staff in January 1942 has left to employ his talents elsewhere—once with War Production Board and then with the United States Steel Export Company as a special representative on petroleum materials. It is from this latter position that he returns to PAW. Robbins began his association with the oil industry in 1926 with the National Supply Company at Tulsa, becoming vice president of the C. F. Camp Company, Tulsa, a year later. In 1931 he went with the Oil Well Supply Company, later becoming manager of sales at Tulsa. He resigned to join PAW as director of materials at Chicago.

Claude E. Parsons *E. E. Robbins*

In announcing the Robbins appointment, Deputy Administrator Ralph Davies said: "As we approach the period when materials regulations and controls doubtless will be modified, it is more than ever essential that we have as the head of our Division of Materials a man thoroughly versed both in industry needs and government procedures."

Parsons has spent about a year and a half with the Federal agency and now resumes his duties as vice president of the Halliburton Oil Well Cementing Company from which he was on leave. Davies commented on Parsons' record with PAW as "uniformly one of highly successful accomplishment."

Biddle's Parting Legacy



Francis Biddle

OWNERSHIP, state or federal, of offshore oil lands — an issue long lurking in the background—has at last been tossed into the open through the filing of a test suit by the government in the United States District Court at Los Angeles. In bringing this long and bitter controversy to a head during his last days in office, Attorney General Francis Biddle planted a delayed action bomb on the desk of his nominated successor Tom C. Clark. Biddle says the suit was filed "after consultation with and approval by" the Interior Department. For several months past it has been reported that Secretary Ickes was on the verge of exploding the issue by granting a federal lease to submerged oil lands off California. At a press conference early in June, President Truman said that he had directed the bringing of the suit.

The department's suit would enjoin operations of the Pacific Western Oil Corporation, which is extracting oil in the Elwood field off the California coast near Santa Barbara, under a lease issued by the state. The outcome, however, would affect not only the legal rights of California but also those of other coastal states that have oil deposits.

Note on Tarakan

AFTER three years' occupation of Tarakan, Netherlands Borneo, and with ample time to

(*Continued on page 68*)

Oil Company Staff Changes

C. E. Davis

J. F. M. Taylor

C. E. DAVIS, general manager of the manufacturing department of Shell Oil Co., New York, has been elected a vice-president to succeed J. F. M. Taylor, vice-president in charge of manufacturing. Mr. Taylor is resigning to return to California in order to devote more time to his personal interests and oil industry consulting work.

During the war years Mr. Davis has been active in a number of industry-government committees, including the aviation gasoline advisory committee of the Petroleum Administrator for War, and is now serving as chairman of its catalytic cracking subcommittee. A native of Oklahoma, he received his early education there and in Missouri. He went to work for the Shell organization in 1917 as a shipping clerk in the company's refinery at Cushing, Okla. In ensuing years he was advanced to other positions at the company's refineries and in 1932 transferred to the main office at St. Louis in the operations section of the manufacturing department. The following year he became assistant to the manager of that department, and in 1938 assistant to the vice-president in charge of manufacturing. In 1940 he was made manager of the manufacturing department, and in 1943 general manager of manufacturing.

Mr. Taylor, as wartime head of Shell's East of the Rockies manufacturing department, has held a position of great responsibility and in addition has served on several petroleum industry committees. He is a member of the District No. 2 refining committee of the Petroleum Administrator for War, the technical advisory committee of the Petroleum Industry War Council, the general refining committee of the American Petroleum Institute, and is a director of the Coordinating Research Council, a joint committee of petroleum and automotive engineers. Mr. Taylor went to California in the middle '20's and in 1926 went to work as a trainee at Shell's Wilmington refinery. He held various supervisory positions at the Wilmington, Martinez, and Dominiguez refineries, and in 1930 returned to Wilmington as superintendent. In 1932, Mr. Taylor was transferred to Shell's St. Louis office to become manager of the manufacturing department there, and, a year later, was elected vice-president. In 1935 he returned to California as president of the company's research affiliate, Shell Development Co., a post which he held until 1943 when he went to New York. Mr. and Mrs. Taylor have a home in San Rafael, Calif., and a ranch in "Mayacamas" in Napa.

DAVID W. HARRIS of Shreveport, Louisiana, has resigned as president of Arkansas Natural Gas Company to accept the presidency of Universal Oil Products Company. Mr. Harris has been an active figure in the oil and gas industry for the past thirty years. In addition to his long service with companies in the Cities Service group he has been prominent in association work and is a vice president and director of the General Mid-Continent Oil & Gas Association, a director of the American Gas Association, and counsellor of the American Petroleum Institute. He is an engineer by training having graduated in 1912 from the Georgia School of Technology with the degree of Bachelor of Science.

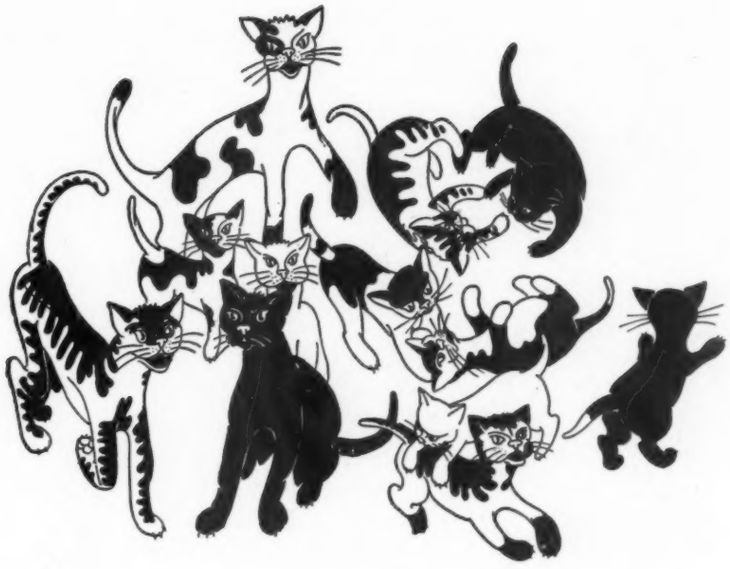
Joseph G. Alther, who has long been associated with Universal Oil Products Company, has resigned as vice president and director but has agreed to continue as a consultant to the company. Macauley Carter upon his request has been relieved of his duties as treasurer and assistant secretary, but is continuing in the service of the company. Brian R. Muirhead has been elected treasurer of the company to succeed Mr. Carter.

Mr. Harris stated that the purpose of the management will be to continue the general business and policies of the company as in the past. It is intended, however, to intensify its research, engineering and service activities in order the better to serve its licensees under the changed conditions of the post war period.

David W. Harris

JOHN W. BRICE, executive vice president and director of Carter Oil Company, affiliate of Standard Oil Company (New Jersey), has assumed the post of assistant coordinator of Jersey Standard's world-wide producing activities. Since graduating from the University of Texas in 1927, Mr. Brice has had broad exploration and producing experience with Jersey Standard affiliates. He spent three years as geologist for Humble Oil and Refining Company in West Texas, and later worked for several years with other affiliated companies in Venezuela. He has been with the Carter Oil Company since 1942.

John W. Brice



All the UOP "Cats" are Purring

—producing base stock for aviation gasoline. Twelve UOP designed fluid catalytic cracking units are in successful operation. All have exceeded performance guarantees.

UOP Designed Fluid Catalytic Cracking Installations:

J. S. Abercrombie Co.
and Harrison Oil Co.
Associated Refineries
Atlantic Refining Co. (2)
Cooperative Refinery Assoc.
Eastern States Petroleum Co.
Frontier Refining Co.
Pennzoil Company
Republic Oil Refining Co.
Root Petroleum Co.
Tidewater Associated Oil Co.
Wilshire Oil Co.

Universal Oil Products Co.
Chicago 4, Ill., U. S. A.

UOP

Petroleum Process Pioneers
For All Refiners

The Refiners Institute of Petroleum Technology

Copyright 1945, Universal Oil Products Co.

Joseph A. Kelley

A. H. Weyland

CITIES SERVICE Oil Company (Pa.), eastern marketing subsidiary of Cities Service Company, has announced the election of Joseph A. Kelley as vice president in charge of sales operations. A native of Massachusetts, and graduate of Massachusetts Institute of Technology and Harvard Graduate School of Business Administration, Mr. Kelley has been 20 years with the Cities Service organization. During World War I he served with the Chemical Warfare Service.

MARC F. BRAECKEL, a director and general sales manager of the Richfield Oil Corporation of New York, has been elected vice-president of the company to fill the vacancy left by the death of George P. MacDonald. Mr. Braeckel has been closely connected with management and administrative problems and policies of Richfield since his association with the company. He was treasurer from 1930 to 1935 and since then has been successively manager of distributor and bulk sales, sales manager and general sales manager.

LOUNSBURY S. FISH, organization counsel for Standard of California, has been lent to the War Department for a period of six months at the request of Maj. Gen. Lucius D. Clay, USA, Deputy of the U. S. Control Council for Germany. Mr. Fish will help develop organizational planning in occupied Germany for the guidance of the U. S. Army, both in military government and civil administration. Previously, Mr. Fish had taken a leave from the oil company to assist Donald M. Nelson as director of the division of organization and planning in the early days of the WPB. Later he occupied a similar position in creating organizational plans for the Petroleum Administration for War. He is co-author of the book, "Top-Management Organization and Control". A native of San Francisco, Mr. Fish was graduated from Stanford University in 1920 with a degree in civil engineering. His home is in Palo Alto.

A. H. WEYLAND, general superintendent of the Arkansas Natural Gas Companies since 1933, has been elected vice-president, general manager, and director of the Arkansas Louisiana Gas Company, Arkansas Natural Gas Corporation, Arkansas Fuel Oil Company, and Arkansas Pipeline Corporation. The resignations of D. W. Harris, former president and B. R. Muirhead, former treasurer, of the Arkansas Natural Gas Corporation, were accepted by the directors. Mr. Harris and Mr. Muirhead resigned to accept executive positions with Universal Oil Products Company.

Joining the Cities Service organization in 1919 after graduaton from Texas A. and M. College, where he received a B. S. degree in electrical engineering, Mr. Weyland moves into his new office with 26 years of experience in the oil business. He first became a part of the Cities Service family in Bartlesville, Oklahoma, when he accepted a position as junior engineer with the Empire Companies. He held various positions in the states served by these companies and in 1933 he was made general superintendent in charge of all operations of the Arkansas Natural and all associated subsidiaries. In 1936 Mr. Weyland was elected vice-president of the Arkansas Louisiana Gas Company, a subsidiary of the Arkansas Natural Gas Corporation.

CHARLES E. FOSTER, vice president of Cities Service Oil Company (Pa.), has retired after 40 years with the Cities Service organization.

He started with the St. Joseph Railway, Light, Heat & Power Company as a clerk in 1902, was made comptroller of the Crew Levick Company in March 1917 and vice president in May 1926. The following year he became general manager. With the reorganization of the Crew Levick Company, he became vice president of Cities Service Oil Company (Pa.) in 1936. He was president of Penn Oil Company and an official of various other Cities Service subsidiaries.

AL HAPKE, JR., has joined the staff of the American Petroleum Industries Committee of the American Petroleum Institute to head its newly created aviation section. The new section will concern itself with problems relating to taxation, the financing of aircraft landing facilities, and related matters. Prior to joining the committee's staff, Mr. Hapke was market research manager for Republic Aviation Corporation and in this capacity participated actively in the work of the various aviation trade associations. From 1940 to 1942, he was advertising manager of the Bell Aircraft Corporation and prior to his affiliation there was on the Chicago advertising staff of Collier's magazine. In 1936 and 1937, as a pilot for Pan American Airways, Inc., he flew all the eastern division's routes through the Caribbean and South America. Mr. Hapke is a Quiet Birdman, a member of the Wings Club, the Institute of Aeronautical Sciences, and the Aviation Committee of the American Marketing Association. He graduated from Yale University in 1933.

SOHIO Petroleum Company, subsidiary of Standard of Ohio, has set up a Gulf coast division with headquarters in Houston to handle its expanding interests in the Coast area. George S. Buchanan, formerly president of the Yegua Corporation, is general manager. He has been active in oil exploration and production for the past two decades. He specialized in geology at the University of Michigan and after leaving the University was connected with the geological departments of the Carter and Barndall Companies. From 1934 to 1939 he was vice president of Adams Oil and Gas Company and since that time has been at the head of the Yegua Corporation. For many years he has been active in the membership of the American Association of Petroleum Geologists.

A. M. MARTIN, vice president of Arabian American Oil Company in charge of manufacturing, left the United States at the end of May to go to Ras Tanura, Saudi Arabia, where the company is erecting a large modern refinery that is scheduled to begin operation within the next few months.

A report from the Chinese Combat Command of the U. S. Army announces the promotion of Capt. Walter B. Stone to the rank of Major. A resident of Fort Worth, Texas, and a former student at the University of Texas where he studied petroleum engineering, Major Stone was employed by the Texas division of Gulf Oil Corporation before taking up military duties. He entered the Army by way of the Officers' Candidate School and the Artillery Pack School at Fort Sill, Okla., and was stationed at Camp Hale, Colorado, before going overseas. He has been in China for the past fifteen months and at present is a field artillery liason team instructor attached to a Chinese army.

Design by Victor Reinganum

MOSAICS OF STEEL

NUMBER ONE

Cast iron as an engineering material has found fresh favour with the advent of high duty irons. The materials, in strength, soundness and physical properties, are a great improvement on the best cast iron of a generation ago. Workington irons enjoy unusual confidence amongst foundry men, particularly for special duties. The unique conditions existing at Workington contribute to the production of superior irons. The pure hematite ores are mined locally and, with rigid control throughout all processes, result in a product having a low sulphur and phosphorus content. All iron manufactured is machine cast and is free from sand and awkward pieces. Refined irons are also made from virgin metal without remelting or the addition of scrap. They are therefore eminently suitable for the production of malleable iron and special castings. Workington pig iron is used as the basis of the finest acid steels.

THE UNITED STEEL COMPANIES LTD

THE UNITED STEEL COMPANIES LIMITED

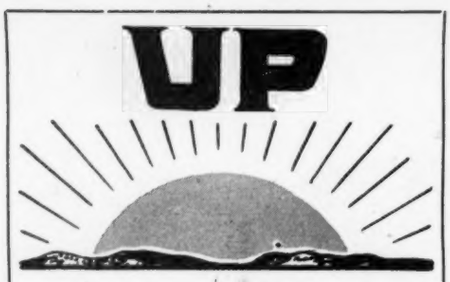
17 WESTBOURNE ROAD • SHEFFIELD 10 • ENGLAND

STEEL, PEECH & TOZER, SHEFFIELD
SAMUEL FOX & CO. LTD., SHEFFIELD
UNITED STRIP & BAR MILLS, SHEFFIELD

APPLEBY-FRODINGHAM STEEL CO. LTD., SCUNTHORPE
WORKINGTON IRON & STEEL CO., WORKINGTON
UNITED COKE & CHEMICALS CO. LTD., CUMBERLAND

THE ROTHERVALE COLLIERIES, TREETON
THE SHEFFIELD COAL CO. LTD., TREETON
THOS. BUTLIN & CO., WELLINGBOROUGH

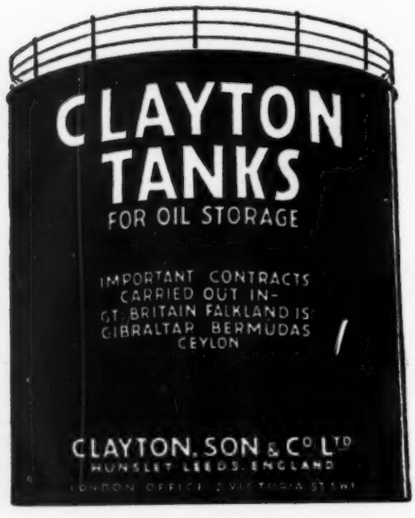
USP. 45



Even as the sun rises daily so do E-C Inclinometer rentals. From month to month goes the word — that this well surveying instrument gives the best results — in less time, less trouble and at less expense.

Write for details.

SPERRY-SUN WELL SURVEYING CO.
1608 WALNUT ST., PHILA. 3, PA.



WASHINGTON NOTES

(Continued from page 57)

repair the damages resulting from the scorched-earth policy followed by the Dutch in 1942, the Japs never got more than one-third of the pre-war production which ran as high as 100,000 tons a month, even though they sank about 200 new wells, according to an Australian Army report. From Tarakan and the Borneo fields, they obtained 35 percent of their petroleum supplies, the United States War Department estimates.

One reason for the failure of the Japs to take more oil from Tarakan during their occupation is attributed to the effectiveness of the "slow-down" tactics employed by the trained Indonesian personnel of the oil installations.

Liberation of Borneo will return to the United Nations one of the richest sources of high-grade petroleum in the Southwestern Pacific. Total production before the Japs took over was about 55,000 barrels a day. Of this about 25 percent was produced from Tarakan, where the depth of the wells runs up to 2,000 feet.

David L. Trax

W. H. Collins

Collins Assistant Director

AMONG the recent changes in PAW personnel is the promotion of William Howard Collins to be assistant director of the Materials Division, succeeding David L. Trax who resigned to rejoin the Gulf staff at Tulsa. Collins had been with PAW since October 1942 and at the time of receiving his new assignment was chief of the Petroleum Equipment Manufacturers' Section. He is a native of Texas and at the age of 19 became a roustabout with the Texas Company. Later he worked his way up to district superintendent with Shell. At the time of joining PAW he was in business for himself at New Iberia, La.

More Drilling Urged

NEED for all-out exploration for new domestic sources of oil to keep the flow to the military at peak level is emphasized by Deputy Administrator Ralph Davies in disclosing that of the current daily crude production in the United States more than 400,000 barrels come from fields and pools discovered since Pearl Harbor. Current daily production averages about 4,800,000 barrels, a gain of a million over the average daily production of 1941.

Bulk of the production from wartime discoveries is coming from the West Edmond field in Oklahoma, the Ellenburger lime pools in West Texas, the recent new production in Mississippi, the Elk Basin Field in Wyoming and Montana, and the 27-B pool in the Buena Vista hills in California. While considerable exploratory work was done in East Coast states during the past three years, no commercially important discoveries of oil were made.

PAW's drilling program for 1945 still calls for completion of 27,000 development and exploration wells. Of this total PAW has asked for the drilling of 5,000 wildcat wells. Davies says it is desirable to increase this program as rapidly as materials and manpower become available.

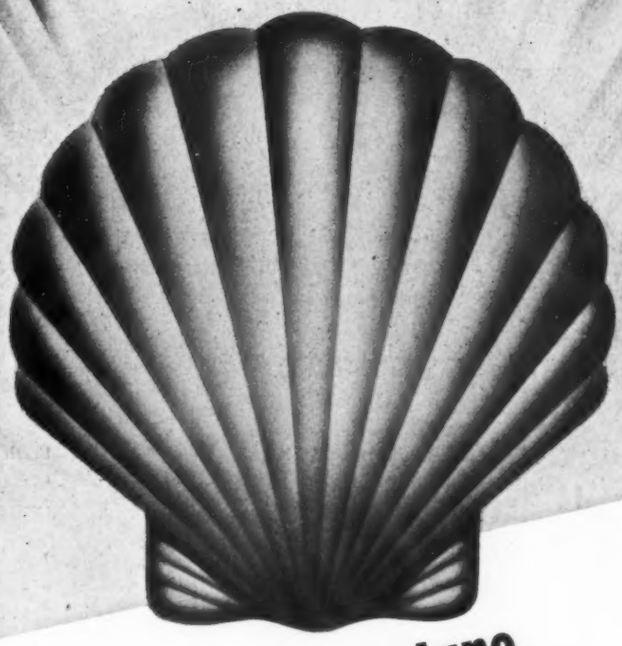
European Operations

ELEVEN members have been added to the oil industry's European Committee, a subcommittee of the Foreign Operations Committee, which will assist in handling petroleum supplies for civilian Europe when the United Nations military forces relinquish responsibility, and as long thereafter as wartime product and distribution shortages exist. They are: F. H. Hayden, New York; S. B. Eckert, Philadelphia; J. M. Gardiner, Washington; S. F. Gysin, New York; H. A. Logan, Warren, Pa.; R. W. McDowell, Tulsa, Okla.; B. H. Morris, Edgewater, N. J.; L. C. Quakenbush, New York; R. E. Ryerson, New York; Joseph Schneider, New York, and Edwin A. Theurkeuf, New York. The appointments have been approved by Deputy PAW Davies.

North Africa Supply

H. A. HASSAN of New York and B. H. Morris of Edgewater, N. J., are two new members of the recently activated North Africa Supply and Distribution Committee, a subcommittee of the Foreign Operations Committee, which will have an active part in supplying that area with petroleum products as soon as the military situation permits and as long as wartime product and transportation shortages exist. Their alternates are A. H. Watts of New York and C. J. Fetzner of Edgewater, N. J. Other members of the committee are N. Goddard, L. K. Blood, J. Parkinson, W. H. Dunning and H. A. Thomas, all of New York; B. P. Newton of Pittsburgh and J F. Wooler of Philadelphia.

ISOPENTANE



—the volatile high-octane component of "Fuels of the Future"

Fully proved in commercial operation, the SHELL PENTANE ISOMERIZATION PROCESS is playing an important part in the wartime 100 octane picture. It will continue in the postwar period to provide refiners with a low-cost, volatile, high-octane component of the finer fuels of tomorrow.

Do your blending calculations show a lack of isopentane? Contact Shell Development Company at 50 West 50th Street, New York 20, New York, for information on

SHELL PENTANE ISOMERIZATION PROCESS

Seaman Zdun Receives Hero's Award

A young tanker seaman who risked his life to save his ship and crewmates has been honored by being the first recipient of the J. Howard Pew award, established by Sun Oil Company last year to honor employees who distinguish themselves by heroic action beyond the call of duty incidental to employment.

The seaman, Val Stanley Zdun, 24, of Chester, Pa., swam 50 yards during a furious inferno of exploding bombs, ammunition and gasoline cans in the harbor of Bari, Italy, to throw off the mooring lines that held the tanker "M. S. Sun" in danger in one of the major disasters of the war in the Mediterranean theater, caused by the explosion of a bomb-laden Liberty ship in Bari Harbor. The blast hurled large pieces of steel, ammunition, doors, desks and other debris over a wide area, setting afire three other ships in the harbor, leveling several buildings, and exploding bombs and gasoline cans stacked on the docks.

The Sun tanker was in immediate danger. Two steel cables and six nine-inch Manila lines held it fast, and there was no one on the dock to release them. Less than 800 yards away scraps of the Liberty ship floated on the water, ships nearby still rocked in a huge tidal wave from the explosion, and the dock was ablaze with gasoline under stacked crates of bombs and shells. Hot small-arms ammunition was exploding. Steel was raining down on the tanker, smashing catwalks, piping and skylights. All doors and glass amidships had been ripped away, and there were three large holes in the deck. Captain Walls ordered the two cables cast off from the ship, but hesitated to cut the Manila lines. Seaman Zdun overheard him express the fear that the lines would float and foul the propeller.

Without orders, and ignoring his own immediate danger, Seaman Zdun swam to the dock, single-handedly cast off five of the heavy Manila lines, then jumped into the water with the sixth, hoping to be hauled aboard with it. Some distance from the dock, however, the line sank. Zdun released it and swam back again to the dock, where he found a row boat in which he returned to his ship. While he worked, explosions were shaking the dock at regular intervals.

Because of the quick action of the entire crew, and particularly the heroism of Seaman Zdun, the Sun was the first ship to leave the harbor, clearing in 35 minutes after the explosion. This record was made despite grave difficulties. About twenty hulls were sunk in the harbor, and Captain Walls had to take his ship through the treacherous channel without a pilot. Only three cylinders of the big Doxford engine were in operation when leaving port.

Sun Oil Company officials disclosed for the first time that the "M.S. Sun" had been torpedoed twice during the war with Germany, first on February 23, 1942, and again on June 16 of the same year.

F. E. PATRICK, field superintendent of Kuwait Oil Co., Ltd., has been spending several weeks in the United States conferring with officials of Gulf Oil Corporation, joint owners with Anglo Iranian Oil Company Ltd. of the Kuwait concession. Mr. Patrick formerly was engaged in field operations for Gulf in Texas and Louisiana. With the ending of the war it is intended to resume drilling operations in Kuwait and Mr. Patrick will return there shortly.

California Petroleum Register

THE 1945 edition of this handbook of the California Oil industry lists the oil companies interested in California oil enterprises including producers, refiners and natural gas manufacturers. It also lists the names and addresses of active California oil men, supply companies, drilling contractors, government agencies having to do with petroleum, and the geological societies and other scientific and trade associations that maintain offices in the state. The aim of the compilers has been to provide a complete guide to the personalities and organizations behind the scenes of the California oil industry.

Users of this handbook will find it useful in obtaining information and establishing contacts in its field. It is published by PETROLEUM WORLD, 412 W. 6th Street, Los Angeles 14, California, and is priced at $5.00.

WELDED PRESSURE VESSELS

HYDROGEN PLANTS
as applied to
CRACKING OF PETROLEUM
HYDROGENATION
OIL SYNTHESIS

5'-0" & 6'-0" DIA. x 72'-0" TOTAL LENGTH

5'-0" & 6'-6" DIA. x 90'-6" TOTAL LENGTH

OUR WORKS ARE EQUIPPED WITH
X-RAY APPARATUS
AND
MODERN TESTING LABORATORY

DISTILLATION PLANTS
FRACTIONATING COLUMNS
HEAT EXCHANGERS
STRIPPERS
VACUUM TOWERS
EVAPORATORS
CONDENSERS

8'-0" DIA. x 59'-6" LONG

ABP
ASHMORE, BENSON PEASE & CO. LTD.
and associate company
THE POWER-GAS CORPORATION LTD.
STOCKTON-ON-TEES
PGC

ACME

We Shall Return

Standard-Vacuum Oil Company rejoices with the people of the Philippine Islands that they can now again enjoy peace and freedom.

For more than 50 years Standard-Vacuum Oil Company's products have contributed to the industrial development of the Philippine Islands. Mindful of the tasks of reconstruction which lie ahead we pledge the resources of our organization to assist in that great work.

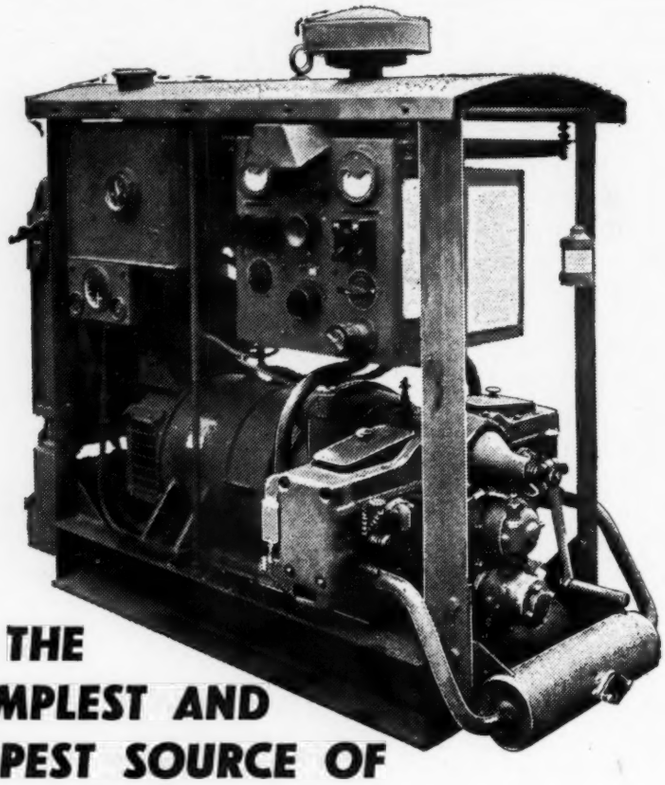
We shall return!

Standard-Vacuum Oil Company

EXECUTIVE OFFICES • 26 BROADWAY, NEW YORK 4, N. Y.

Joins Ideco Staff

GEORGE W. ("JACK") WALTON has assumed the post of manager of drilling machinery sales of International Derrick & Equipment Company—one of the Dresser Industries—it is announced by Ferguson Barnes, general manager of sales. A native of Belton, Texas, Walton attended Missouri School of Mines until he joined the Air Service in World War I. His subsequent business career has been almost entirely devoted to oil field equipment. Just prior to joining IDECO, he was connected with the development and handled the sales of the new Clark Bros. mud pump. He is a member of the American Society of Mining Engineers, the American Petroleum Institute, the Nomads (Tulsa Chapter), the Engineers Club of Tulsa, the Tulsa Club, and the Dallas Petroleum Club. His headquarters are in Dallas, where he will be assisted by Carl Engelmohr, formerly advertising manager at IDECO's Beaumont plant.



THE SIMPLEST AND CHEAPEST SOURCE OF 8-12 b.h.p. IS A

CUB DIESEL

The horizontal design of the "**CUB**" diesel gives inherent balance. It is a high-speed low-weight engine of 1006 c.c. capacity with a continuous heavy duty rating of 12 b.h.p. at 1,800 r.p.m. The "**CUB**" will start from cold, it will give good service for many years with practically no attention and uses very little fuel.

OIL ENGINES (COVENTRY) LTD.
Atlantic Works, Harefield Road, Coventry

Expands Marketing Facilities

GENERAL PETROLEUM CORPORATION has acquired the distributing facilities formerly operated by Continental Oil Company in Arizona, eastern Washington and northern Idaho, consisting of 65 bulk plants and 54 retail service stations. The sale price was not announced but is understood to be in excess of $1,500,000.

The sale was motivated by the fact that the areas affected is marginal territory for Continental since its refineries are all located east of the Rocky Mountains. As explained by Harry J. Kennedy, vice president in charge of marketing, it represents a further step in the company's policy of concentrating its marketing investment in sections where it is a fully integrated operator and holds a sound competitive position.

API Medical Committee

PRESIDENT W. R. BOYD, JR., of the American Petroleum Institute, has announced the formation of a Medical Advisory Committee for the consideration of subjects involving medical problems peculiar to the oil industry. McIver Moody of Standard Oil Company of New Jersey is chairman of the committee and D. V. Stroop is secretary. Doctors from the medical staffs of sixteen oil companies comprise the committee membership and a group of associates has been designated to cooperate in research and special studies.

Coatings for Pipe Lines

A complete line of coatings, enamels and primers for oil, gas, gasoline, tanks and water lines is announced in a new booklet by the Reilly Tar & Chemical Corp. These products are furnished in standard grades and in special grades for special purposes.

Oil Property Map of Colombia

Scale: 1 to 1,000,000
Showing in Color

1. Concessions in force of major operators
2. Private oil properties, with firm title
3. Concessions tested and surrendered
4. Location of all wildcats drilled in the country: depths, oilfields; pipelines and stations
5. Concession applications officially accepted Measures 1.80 x 1.05 meters (6' x 3.5')

E. OSPINA-RACINES
Publisher

COLOMBIAN OIL-NEWS DIGEST

Confidential letter-reporting wildcatting-oil developments 5th Year of Publication Air Mailed Weekly.

Address: Apartado 27-23
Bogota, Colombia

One Jointing for all purposes

Let "Klingerit," the Universal Jointing, replace the several different kinds usually stocked on your shelves for various purposes, and thus simplify ordering and stock control and reduce the risk of an unsuitable material being used by mistake.

"Klingerit" Compressed Asbestos Jointing can be supplied in all thicknesses ranging from ·008" to ¼" and can be used for saturated and superheated steam at high pressures and temperatures, hydraulic pressures, compressed air and gases, oils, petrol, solvents, refrigerants, alkalis, and most acids.

RICHARD KLINGER LTD.

KLINGERIT WORKS · SIDCUP · KENT . *TEL*: FOOTS CRAY 3022

Crawford Joins Maloney Tank

HAROLD D. CRAWFORD, who has been president of the Crawford Tank and Supply Co., has severed his connection with that company and has purchased an interest in the Maloney Tank Manufacturing Co., of Tulsa, assuming the duties of secretary and treasurer. Mr. Crawford is a son of the late David Crawford of Parkersburg, W. Va., who with his brother John established the Parkersburg Rig and Reel Co.

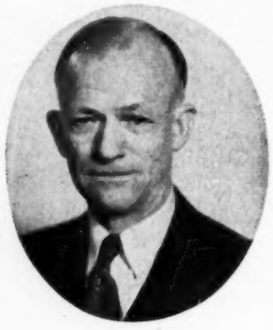
O. W. Maloney will continue as president and chief executive officer of the Maloney company. He is the son of the founder, O. W. Maloney, Sr., who originally patented the bolted steel tank. Mr. Warren, chairman of the board, retires from the company after over 30 years of service. J. C. Highfill will remain as vice-president and general manager.

The Maloney company, established in 1915, is one of the oldest oil field tank and equipment manufacturers in the Mid-Continent area. During the war it has devoted a major portion of its productive capacity to making tanks and portable air field landing strips for the armed forces. It is now resuming the commercial production of its regular bolted steel tanks, welded steel tanks, oil and gas separators, heaters and treaters for the domestic and export trade.

Harold D. Crawford

O. W. Maloney

for ANY size *Gasket* for *EVERY Job!*



Call **STEVENS 4-3072 Tulsa**

Stevens Precision-Built Gaskets go into vital installations wherever oil is produced. They are the vital seal for maximum performance. This is the only plant manufacturing metal-asbestos filled gaskets west of the Mississippi—closest to the source of supply for every Western need.

STEVENS Ring Type Cylinder Head Gaskets. Guaranteed not to blow-out or burn-out under pressure. The best cylinder head gasket made for any gas engine your money can buy—not a critical material.

Gaskets of Copper, Aluminum or other metals.

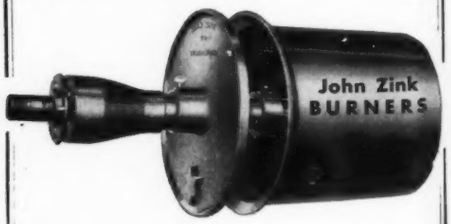
All types of Rubber Gaskets.

We can build any size or type gasket— you furnish the drawing or template.

STEVENS ASBESTOS PRODUCTS CO.

GASKET MANUFACTURERS INSULATING MATERIALS AND CONTRACTORS

322-4-6 East First St. *Call 4-3072* Tulsa, Oklahoma



For: Power Boilers — Gasoline Plant Boilers — Treating Furnaces — Industrial Boilers — Heating Boilers — Domestic Furnaces

Refinery Stills and Furnaces

◆

"JOHN ZINK PRODUCTS MUST BE GOOD"

JOHN ZINK COMPANY

4401 South Peoria Tulsa, Oklahoma

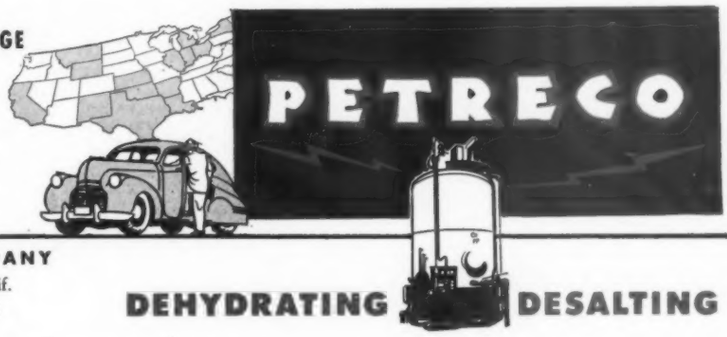
Briefed down, condensed in this Petreco Field Serviceman's Kit is information which is the result of years of experience, of countless tough emulsion problems analyzed, of thousands of "case histories" solved, one of which may be similar to yours.

These records may not always fit your situation but they give us a starting point from which to step. They are like the lawyer's reference in legal work, the doctor's library in medical practice—they are textbooks of reference for a practical problem. In these records, and in the field serviceman's head from his years of training and contact with the problems of others, may lie the answer to your particular emulsion problem.

The Petreco Field Serviceman is a highly trained specialist. His job is to determine a practical solution to whatever problems may arise. He is backed by the entire staff of the Petreco Field and Research Divisions. Call him in on your problem . . . no obligation, of course.

COMPLETE U. S. OIL STATE COVERAGE WITH PETRECO PROCESSES

Resident field engineers are located in refining and producing centers wherever Petreco processes are in use. These men are specialists, and are always available to assure maximum operating efficiency, and to give helpful advice and assistance on any problem of dehydration or desalting.



PETROLEUM RECTIFYING COMPANY
530 West Sixth Street, Los Angeles 14, Calif.
5121 So. Wayside Dr., Houston 1, Texas
648 Edison Building, Toledo 4, Ohio
Representatives in principal production and refining centers

DEHYDRATING DESALTING

HIGH TEMPERATURE

Bolting

TO YOUR SPECIFICATIONS

ERIE'S heat treating department is equipped to handle large or small orders of studs, bolts and nuts heat treated in the most economical way. Here again, Erie's 31 years of exclusive bolting experience is available to help meet special bolting specifications which are constantly being advanced.

ALLOYS • STAINLESS • CARBON • BRONZE

ERIE Bolting

ERIE BOLT & NUT CO • ERIE, PA.

Clark Changes Policy

A major change in the nationwide sales and distribution of its products is announced by The Clark Manufacturing Company, manufacturers of steam specialties and fluid controls extensively used in the industry. During the past 37 years, steam and vacuum traps, pressure regulators, separators, and other steam specialties have been manufactured by Clark and marketed under the name of "Strong Steam Specialties." For this reason, the identity of the Clark company itself has been little known in the field, although the products manufactured by it have been widely distributed.

The changed policy brings all of the activities of product designing, engineering, manufacturing, sales and distribution under one roof of The Clark Manufacturing Company. From now on the Company's products will be sold as "Clark Fluid Controls," and henceforth the Clark company will maintain its individual identity, and deal directly with its distributors and customers on a nationwide scale. There will be no lapse in production.

Heads New Export Company

LLOYD G. ENSIGN, formerly general manager of Lee C. Moore & Company, Eastern Division, has resigned to become president of Oilfield-Industrial Export, Inc., with offices at 30 Rockefeller Plaza, New York, a company organized to engage in sales and service for the foreign market, specializing in oilfield and industrial equipment. Mr. Ensign has been closely identified with the petroleum industry for the past twenty-four years, fifteen of which were spent in charge of oil producing operations in South America and the West Indies. Another six years were devoted to oilfield equipment sales in export and for the past two years he has engaged in the direction of operations and sales for Lee C. Moore & Company, Eastern Division.

Lloyd G. Ensign

d dis-
The
turers
sively
years,
lators,
e been
er the
r this
itself
gh the
widely

ties of
turing,
f The
ow on
'Clark
x com-
y, and
tomers
o lapse

ay

l man-
ern Di-
ent of
fices at
ompany
for the
and in-
closely
for the
h were
ions in
Another
uipment
ears he
ons and
Eastern

Ensign

OLEUM